

# GLOBAL CLIMATE HIGHLIGHTS

## MAJOR CLIMATIC EVENTS AND ANOMALIES AS OF NOVEMBER 9, 1991

### 1. Central North America:

#### ARCTIC BLAST ENCOMPASSES REGION.

The western half of Canada and the central two-thirds of the U.S. recorded weekly temperatures 2°C to 16°C below normal, with the greatest departures measured in the central Plains. Readings dropped below -32°C in portions of the Colorado Rockies while wind chills plummeted to -44°C in southern Manitoba [3 weeks].

### 2. The Pacific Northwest and Southwestern Canada:

#### MODERATE PRECIPITATION EASES DRYNESS.

Most coastal locations measured 60-90 mm of precipitation while 30-70 mm dampened the western interiors of Washington, Oregon, and British Columbia, decreasing moisture deficits [Ended after 10 weeks].

### 3. Central United States:

#### MUCH DRIER WEATHER PREVAILS.

Cold and dry Arctic air spread throughout the region, with less than 15 mm of precipitation reported [Ended after 3 weeks].

### 4. Central Appalachians and Southeastern United States:

#### PRECIPITATION DAMPENS THE CAROLINAS, BUT DRYNESS CONTINUES ELSEWHERE.

A developing coastal storm spread 20-50 mm of precipitation across the Carolinas and southeastern Georgia, but lesser totals (under 15 mm) provided limited relief elsewhere. Most locations have received 50-75 mm below normal rainfall since late September, with scattered 90-110 mm deficits reported in northern Georgia, the western Carolinas, and southwestern Virginia. According to press reports, more than 1,000 wildfires have burned over 1350 square kilometers since October 26, and smoke from the fires raised the air quality index at Charleston, WV to 353 on Wednesday (values over 200 are irritating and unhealthful for all individuals). Fortunately, cooler weather and light precipitation aided in the containment of many fires [7 weeks].

### 5. Central and North Atlantic Coast:

#### ANOTHER POWERFUL STORM BATTERS REGION.

A strong storm system developed along the Georgia coast at the end of the week and moved northeastward, becoming the second storm in two weeks to spread gusty winds, coastal flooding, and beach erosion from North Carolina's Outer Banks to Massachusetts's Cape Cod. This second system, however, did not generate the widespread property damage that the previous storm did [Episodic Event].

### 6. Central and Southeastern Europe:

#### TEMPERATURES MODERATE LATE IN THE WEEK.

Near normal conditions spread into the region following a very chilly start to the week. Weekly departures of -3°C to -7°C were reported from northern Italy eastward to the central Urals and southeastward through the Balkans and western Turkey. Daily departures as low as -16°C afflicted Bulgaria [Ending after 3 weeks].

### 7. Southeast Asia:

#### SEASONABLE RAINS END WET SPELL.

Only 10-40 mm of rain fell on most locations despite the proximity of Tropical Depression Thelma, which dissipated near southeastern Vietnam [Ended after 3 weeks].

### 8. Taiwan, the Ryukyus, and Southern Japan:

#### MOISTURE SURPLUSES DIMINISH AS LIGHT RAINS DAMPEN REGION.

Most of southern Japan measured 20-60 mm of rain, with little or none falling in the Ryukyus and Taiwan, signalling an end to the recent wetness [Ended after 3 weeks].

### 9. The Philippines:

#### TROPICAL STORM THELMA SPAWNS SEVERE FLASH FLOODS AND MUDSLIDES.

Tropical Storm Thelma trekked through the central Philippines, deluging some locations with 140 mm of rain in one day. The heavy rains fell on mountains that had been denuded by years of logging, causing mudslides that took over 5000 lives according to press reports. Most of the fatalities occurred in Omroc, a logging port located 565 km southeast of Manila. Thelma was the most deadly natural disaster to afflict the Philippines since a 1976 tsunami took 8000 lives in Mindanao [Episodic Event].

### 10. Indonesia:

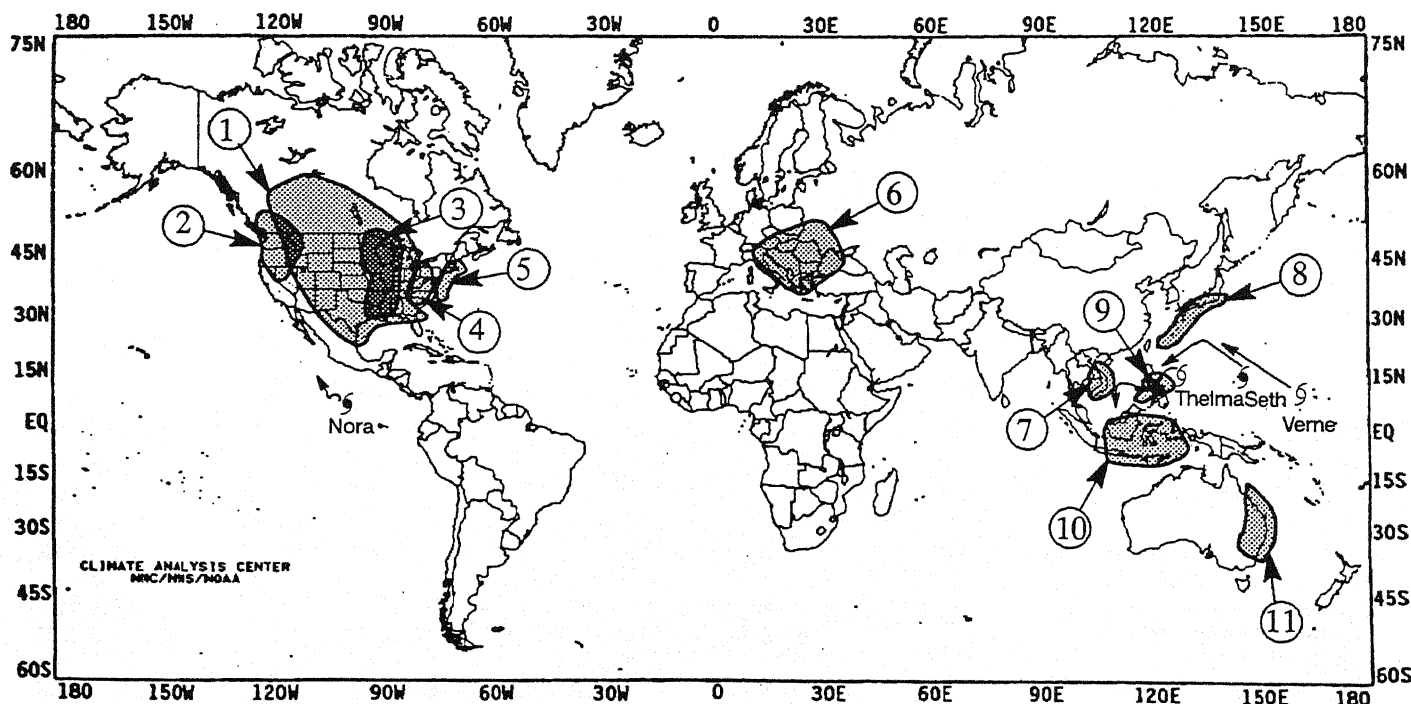
#### HEAVY RAINS SOAK WESTERN AREAS WHILE DRYNESS INTENSIFIES FARTHER EAST.

The northwestern half of Sumatra was soaked by 90-250 mm of rain, with daily amounts reaching 125 mm, while western sections of Java recorded 80-135 mm. Farther east, however, abnormally dry conditions continued. 20-50 mm of rain dampened Indonesian Borneo (up to 90 mm fell on isolated sections of the southeastern coast), and only scattered totals of 20-40 mm were reported elsewhere. Since late September, much of Sumatra, Borneo, and Java have measured 80-320 mm below normal rainfall while 50-100 mm shortfalls have accumulated through the Moluccas, Irian Jaya, the Celebes, and the Sundas [3 weeks].

### 11. Eastern Australia:

#### MODERATE RAINS OBSERVED IN VICTORIA, BUT DROUGHT CONDITIONS REMAIN ELSEWHERE.

Southeastern New South Wales and most of Victoria were dampened by 20-50 mm of rain, providing some relief from the prolonged dry spell. Farther north, however, only scattered totals of 5-20 mm generated little decrease in the region's moisture deficits. Many areas have received 50-75 mm less than normal rainfall during the last six weeks, with scattered 100-120 mm deficits reported south of 27°S [3 weeks].



### EXPLANATION

TEXT: Approximate duration of anomalies is in brackets. Precipitation amounts and temperature departures are this week's values.

MAP: Approximate locations of major anomalies and episodic events are shown. See other maps in this Bulletin for current two week temperature anomalies, four week precipitation anomalies, long-term anomalies, and other details.

# UNITED STATES WEEKLY CLIMATE HIGHLIGHTS

## FOR THE WEEK OF NOVEMBER 3 – 9, 1991

Bitterly cold Arctic air more typical of January than early November invaded portions of the eastern U.S. while the nation's midsection remained abnormally frigid since late October. Over 450 daily record lows were produced during the week as subzero temperatures were found as far south as New Mexico and Missouri. Since the start of the cold spell (Oct. 28), temperatures have averaged more than 20°F below normal in the northern and central Plains, dozens of locations have observed readings below 0°F [Figure 1], nearly 600 new daily minimum temperature records have been set, and over two dozen October record lows were established. In addition, light snow blanketed areas from the central Plains eastward into the Ohio Valley while another major storm formed off the South Carolina coast late in the week, threatening locations along the Atlantic Coast with additional beach erosion and flooding. Elsewhere, the 49th and 50th states experienced above normal temperatures and below normal precipitation except for heavy rains in extreme southeastern Alaska.

Early in the week, bitterly cold conditions covered the eastern half of the country, particularly the Great Plains and Midwest, setting over 50 record lows on Sunday, more than a hundred on Monday, and nearly 75 on Tuesday. Meanwhile, a storm system and associated cold front pushed southeastward out of southwestern Canada into the northern Plains, generating frozen precipitation across the north-central states and bringing a reinforcing shot of Arctic air into the northern Plains by Tuesday. Farther west, a Pacific storm dumped rain on western Oregon and Washington, but the Southwest was mild and dry.

During the latter half of the week, the cold front in the Plains slowly tracked eastward. Exceptionally cold air settled over the Mississippi, Ohio, and Tennessee Valleys as more than 225 daily record lows were broken during Nov. 6–9. A weak wave of low pressure developed along the front, dusting parts of the lower Mississippi Valley with snow. By the weekend, a large dome of high pressure dominated the Midwest and South while a storm developed off the South

Carolina coast. Farther west, an approaching system brought showers to the Pacific Northwest, and warm and dry weather persisted in the Southwest.

According to the River Forecast Centers, the largest weekly totals (more than 2 inches) were reported in the Pacific Northwest, southeastern Alaska, and eastern Carolinas [Table 1]. Light to moderate amounts fell across most of the northern half of the country west of the Appalachians, along the western and eastern thirds of the Gulf Coast, and in portions of the Southeast. Little or no precipitation occurred in California, the southern and central Rockies, southern Plains, parts of the middle Mississippi and Tennessee Valleys, and most of the mid-Atlantic and New England. Although little precipitation fell, lower temperatures aided firefighters battling Appalachian woodland fires. Since Oct. 26, over 337,000 acres have been scorched in nine eastern states, including more than 275,000 acres in West Virginia.

Above normal temperatures were confined to the Far West and most of Alaska and Hawaii. The greatest departures (more than +8°F) were found in the Sierra Nevadas, Great Basin, and western Alaska [Table 2]. While much of the nation east of the Rockies endured cold conditions, highs in the valleys of California rose into the eighties while temperatures in the desert Southwest soared into the nineties.

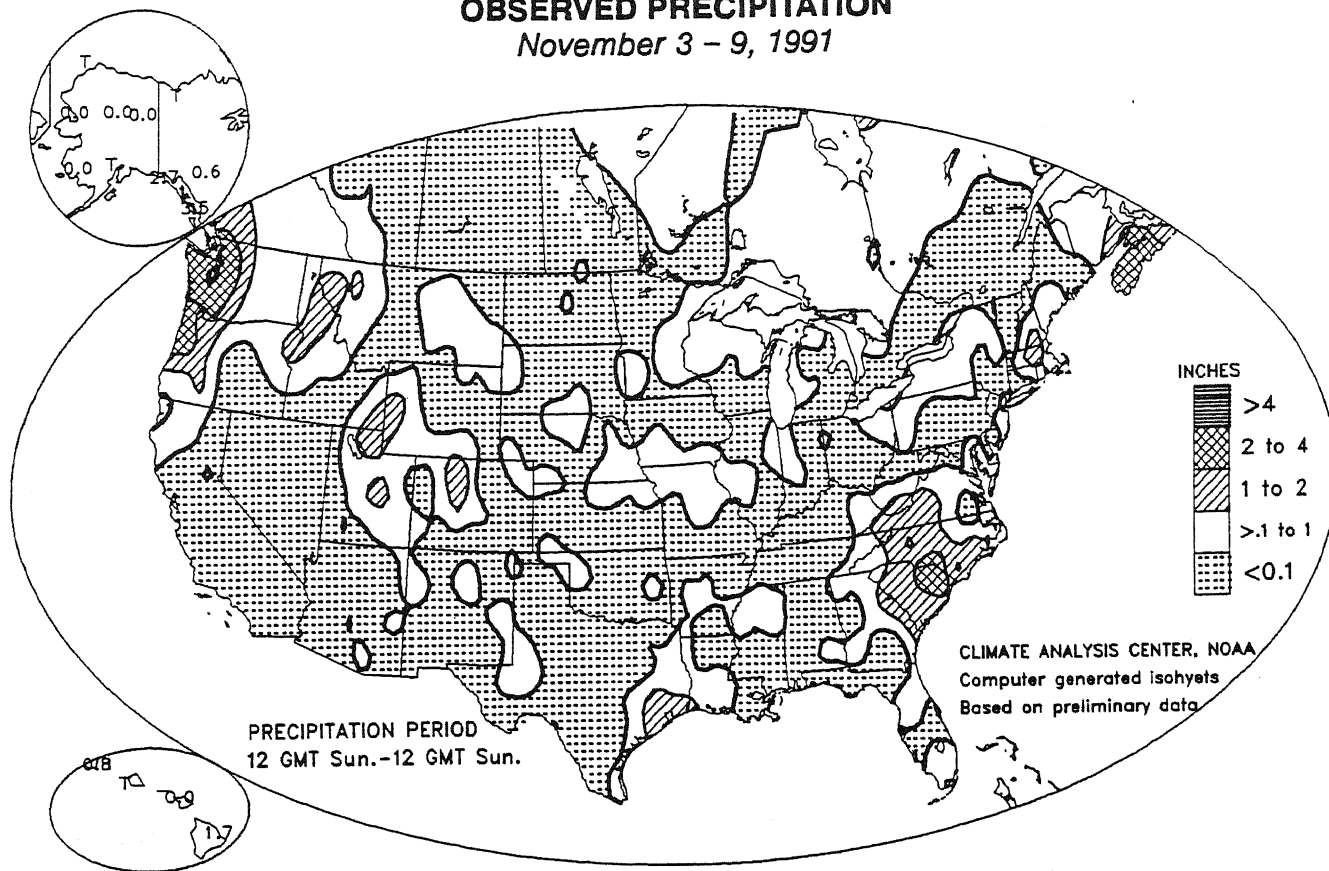
For the second successive week, well below normal temperatures covered the nation's midsection, and colder than usual conditions replaced last week's mild weather in the East. Temperatures averaged more than 20°F below normal in the upper and middle Mississippi and upper Ohio Valleys [Table 3], and between 10°F and 20°F below normal across the eastern half of the U.S. with the exception of northern New England, southern Florida, and the immediate Atlantic Coast. Subzero readings were measured in the north-central states and upper Midwest, and lows dipped below freezing throughout the eastern three-quarters of the country, except in southern Texas, Florida, coastal Carolina, and Cape Cod.

**TABLE 1. SELECTED STATIONS WITH 1.50 OR MORE INCHES OF PRECIPITATION DURING THE WEEK OF NOVEMBER 3 – 9, 1991**

<u>STATION</u>	<u>TOTAL</u> <u>(INCHES)</u>	<u>STATION</u>	<u>TOTAL</u> <u>(INCHES)</u>
ANNETTE ISLAND, AK	6.03	YAKUTAT, AK	2.47
KODIAK, AK	4.91	JUNEAU, AK	2.08
QUILLAYUTE, WA	3.70	FAYETTEVILLE/POPE AFB, NC	1.93
ASTORIA, OR	3.19	MYRTLE BEACH AFB, SC	1.82
FLORENCE, SC	2.87	BELLINGHAM, WA	1.81
STAMPEDE PASS, WA	2.77	FAYETTEVILLE/FT BRAGG, NC	1.75
SITKA, AK	2.68	HOQUIAM, WA	1.65
EUGENE, OR	2.61	SUMTER/SHAW AFB, SC	1.63
WILMINGTON, NC	2.60	TACOMA/MCCHORD AFB, WA	1.52
KETCHIKAN, AK	2.50	PORTLAND, OR	1.50

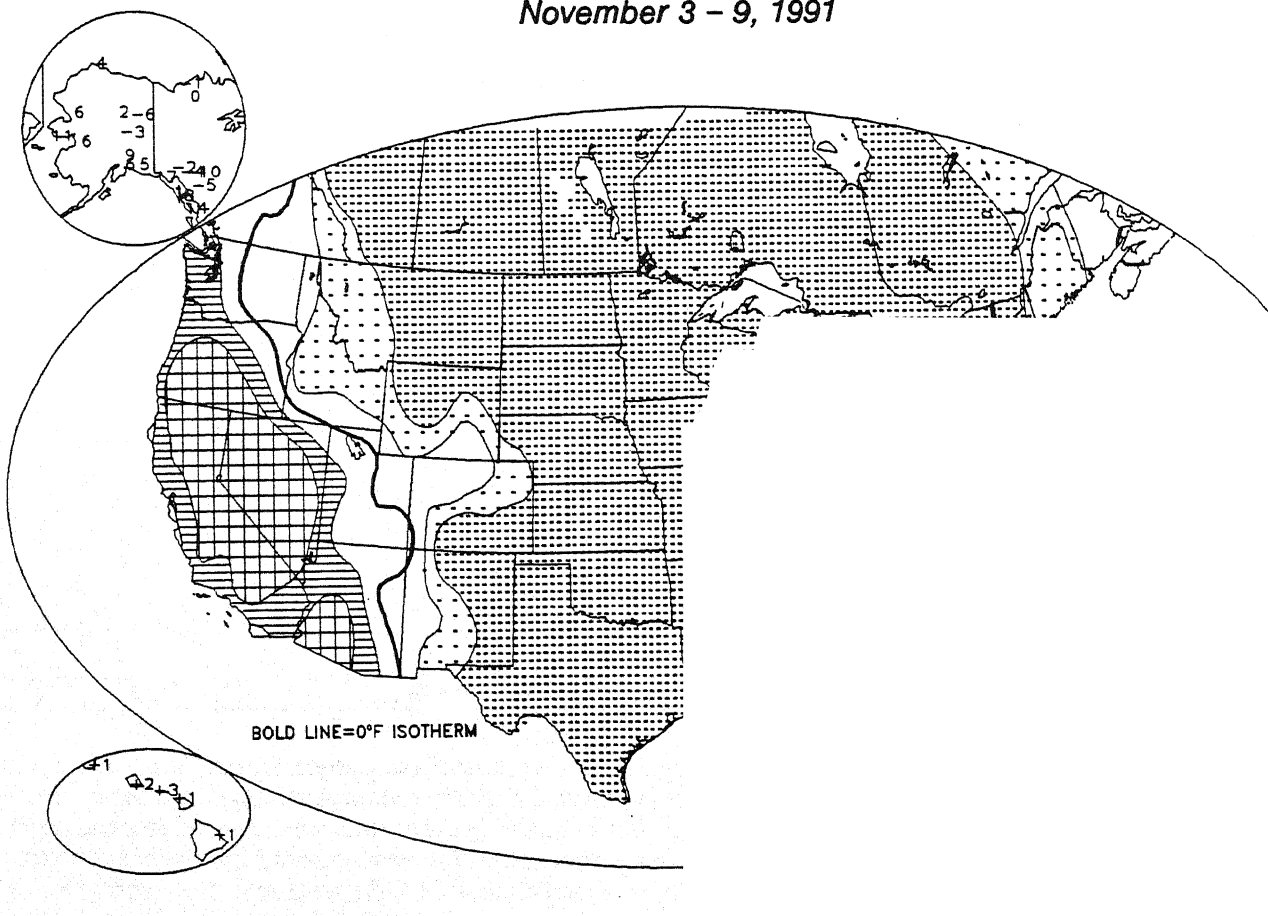
# **OBSERVED PRECIPITATION**

November 3 - 9, 1991



# **DEPARTURE OF AVERAGE TEMPERATURE FROM NORMAL (°F)**

November 3 - 9, 1991



**TABLE 2. SELECTED STATIONS WITH TEMPERATURES AVERAGING 7.0°F OR MORE ABOVE NORMAL FOR THE WEEK OF NOVEMBER 3 – 9, 1991**

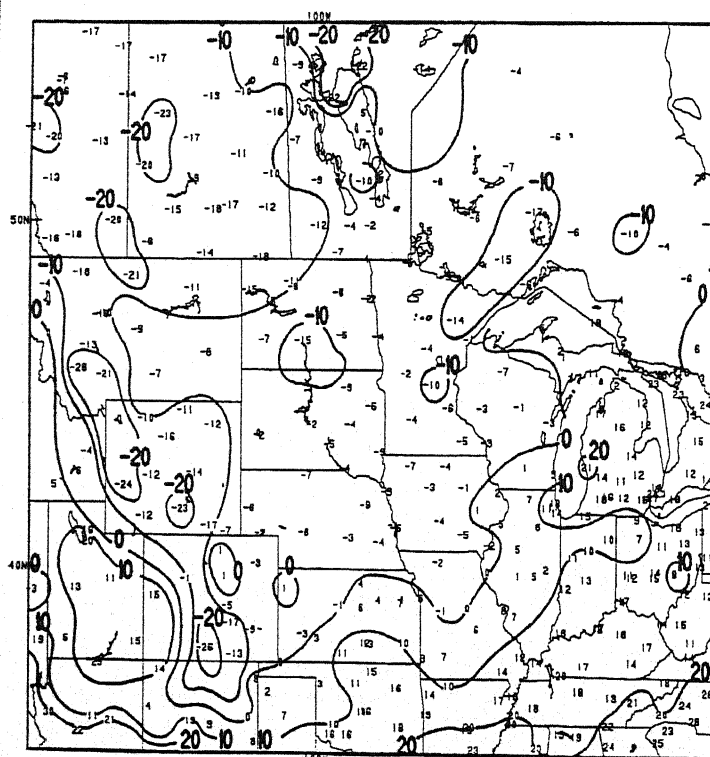
STATION	DEPARTURE (°F)	AVERAGE (°F)	STATION	DEPARTURE (°F)	AVERAGE (°F)
VICTORVILLE/GEORGE AFB, CA	+12.2	64.4	KENAMUNI, AK	+8.7	34.5
KING SALMON, AK	+12.2	38.9	YUMA, AZ	+8.6	75.9
BLUE CANYON, CA	+11.7	58.4	SAN BERNARDINO/NORTON AFB, CA	+8.6	68.9
ILIAMNA, AK	+11.7	39.2	SITKA, AK	+8.3	47.5
NOME, AK	+11.6	31.9	KODIAK, AK	+7.9	44.4
RENO, NV	+11.3	54.1	PHOENIX, AZ	+7.6	71.7
MEDFORD, OR	+11.2	57.5	RED BLUFF, CA	+7.5	64.1
MT SHASTA, CA	+10.0	53.6	LOVELOCK, NV	+7.5	49.8
SEXTON SUMMIT, OR	+9.8	53.6	BURBANK/HOLLYWOOD, CA	+7.4	69.1
TALKEETNA, AK	+9.4	31.3	CORDOVA/MILE 13, AK	+7.4	40.8
TONOPAH, NV	+9.1	52.8	YAKUTAT, AK	+7.1	41.9
WINNEMUCCA, NV	+9.1	49.9	DAGGETT, CA	+7.0	66.8
HOMER, AK	+8.9	40.6			

**TABLE 3. SELECTED STATIONS WITH TEMPERATURES AVERAGING 22.0°F OR MORE BELOW NORMAL FOR THE WEEK OF NOVEMBER 3 – 9, 1991**

STATION	DEPARTURE (°F)	AVERAGE (°F)	STATION	DEPARTURE (°F)	AVERAGE (°F)
OTTUMWA, IA	-26.6	17.7	NORTH OMAHA, NE	-24.1	19.9
ROCHESTER, MN	-26.4	11.9	DUBUQUE, IA	-23.8	16.8
CHAMPAIGN, IL	-25.9	19.9	NORFOLK, NE	-23.7	16.9
QUINCY, IL	-25.9	20.0	SIOUX FALLS, SD	-23.5	14.4
DES MOINES, IA	-25.6	17.7	LA CROSSE, WI	-23.5	17.1
DECATUR, IL	-25.5	21.3	KANSAS CITY, MO	-23.5	25.4
CEDAR RAPIDS, IA	-25.4	17.5	EAU CLAIRE, WI	-23.3	13.7
SIOUX CITY, IA	-25.2	16.1	PEORIA, IL	-23.3	20.8
MASON CITY, IA	-25.1	14.0	ROLLA, MO	-23.3	24.9
SPENCER, IA	-25.0	13.6	WATERLOO, IA	-23.1	17.1
OMAHA/EPPLEY, NE	-25.0	19.2	MOLINE, IL	-22.8	20.7
MINNEAPOLIS, MN	-24.9	13.4	BELLEVOUE/SCOTT AFB, IL	-22.8	24.9
COLUMBIA, MO	-24.9	23.1	LINCOLN, NE	-22.7	20.4
KANSAS CITY/INTL, MO	-24.7	24.1	PARK FALLS, WI	-22.5	12.7
BURLINGTON, IA	-24.5	19.3	ST LOUIS, MO	-22.3	26.2
SPRINGFIELD, IL	-24.5	22.0	CHICAGO/O'HARE, IL	-22.0	22.6
ST CLOUD, MN	-24.2	11.5			

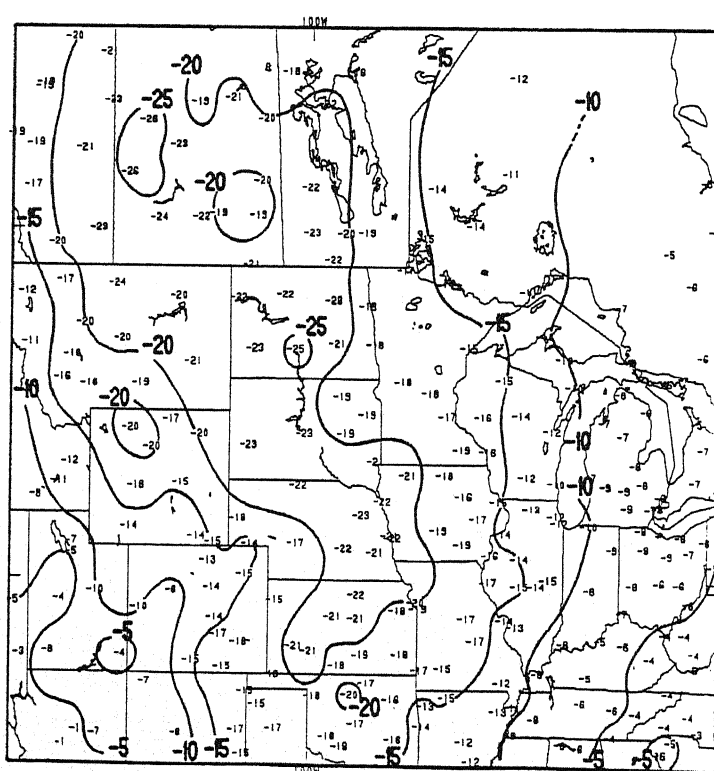
**EXTREME MINIMUM  
TEMPERATURE (°F)**

October 28 – November 9, 1991



**DEPARTURE FROM NORMAL AVERAGE  
TEMPERATURE (°F)**

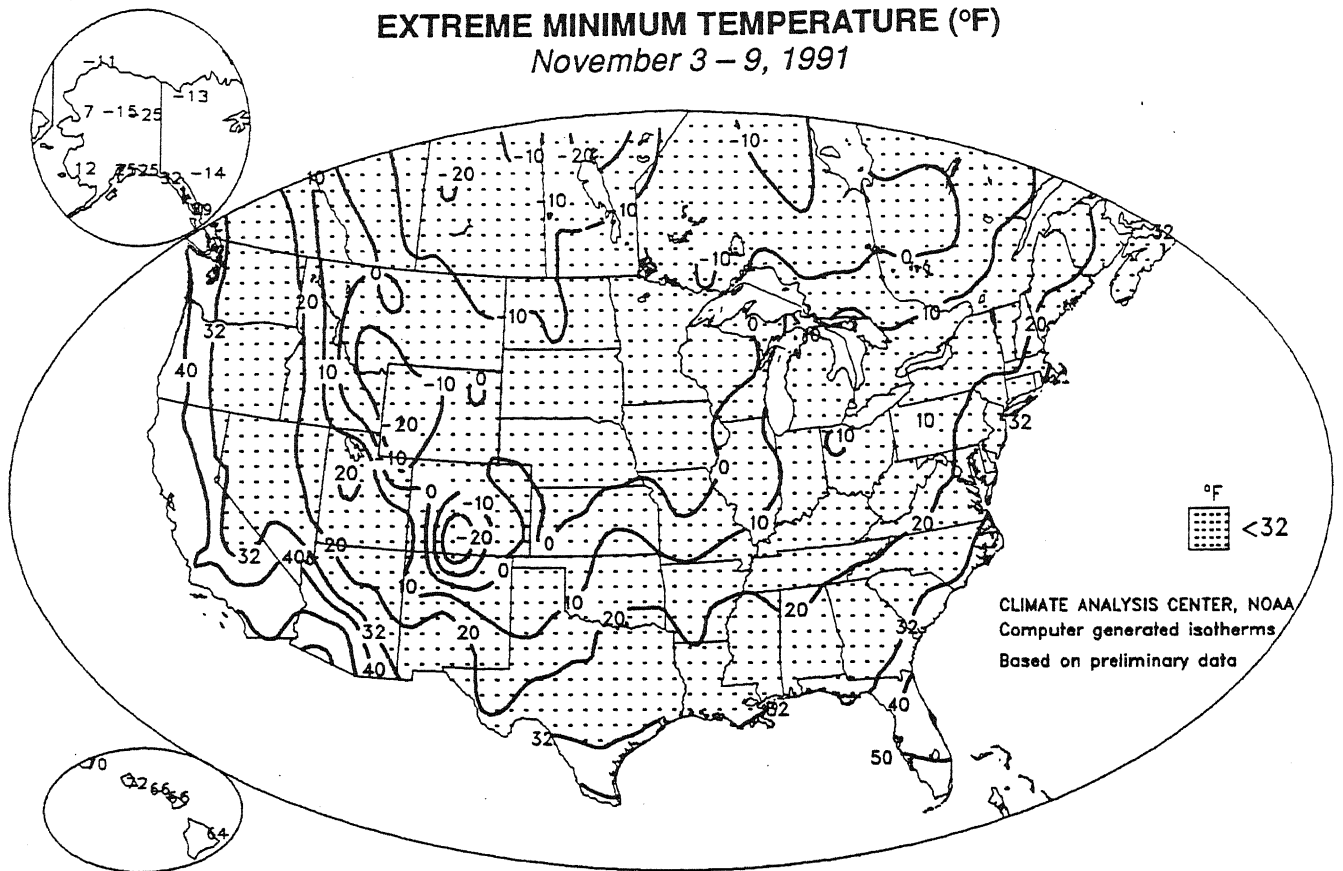
October 28 – November 9, 1991



**FIGURE 1.** Several intrusions of Arctic air plunged southward into the central and eastern United States during the past two weeks, bringing an early-season cold spell to much of the nation. Subzero readings reached into the central Plains and middle Mississippi Valley while temperatures dropped as low as -26°F in the northern and central Rockies (left). More than 600 daily low temperature records were broken, with many stations setting new records for several successive days. Temperatures averaged more than 20°F below normal for the period October 28 to November 9, 1991 across much of the northern Rockies and northern and central Plains (right).

## EXTREME MINIMUM TEMPERATURE (°F)

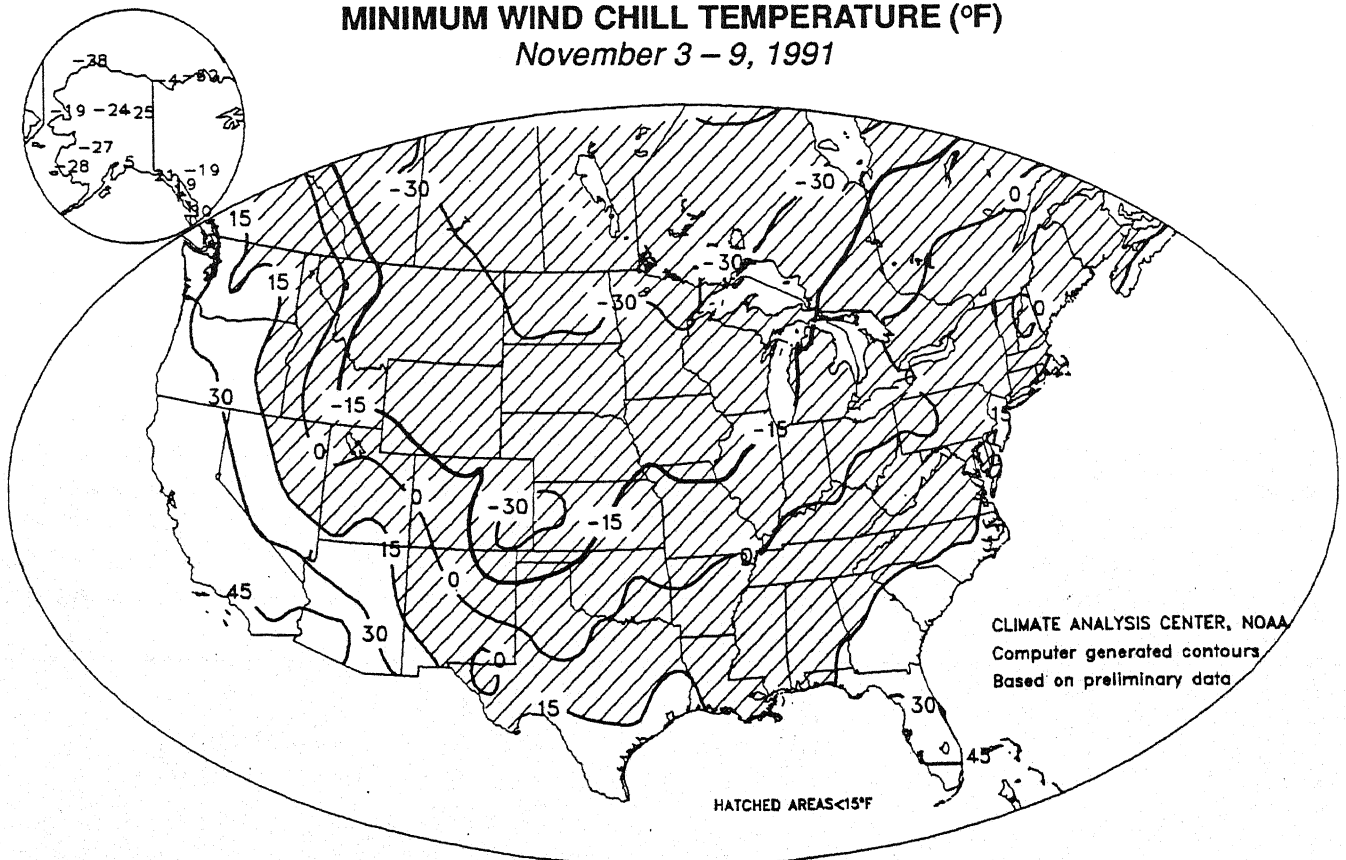
November 3 – 9, 1991



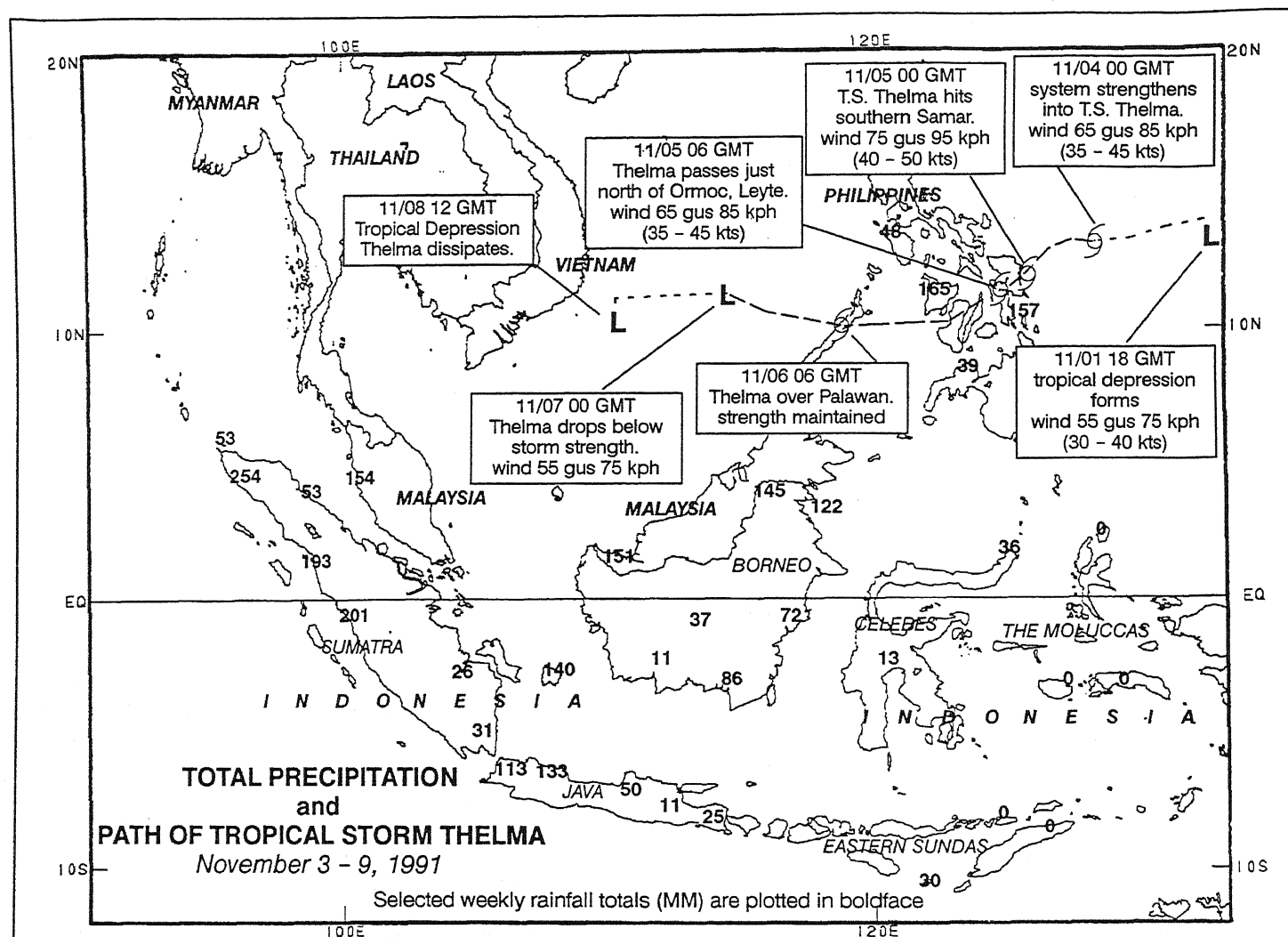
Frigid Canadian air invaded much of the nation as temperatures remained above freezing only in the Pacific and southern Atlantic seaboard, the desert Southwest, and southern Texas (top). Gusty winds combined with the arctic air to produce bitter wind chills ( $<-30^{\circ}\text{F}$ ) across the northern Great Plains and central High Plains (bottom).

## MINIMUM WIND CHILL TEMPERATURE (°F)

November 3 – 9, 1991



# GLOBAL CLIMATE HIGHLIGHTS FEATURE

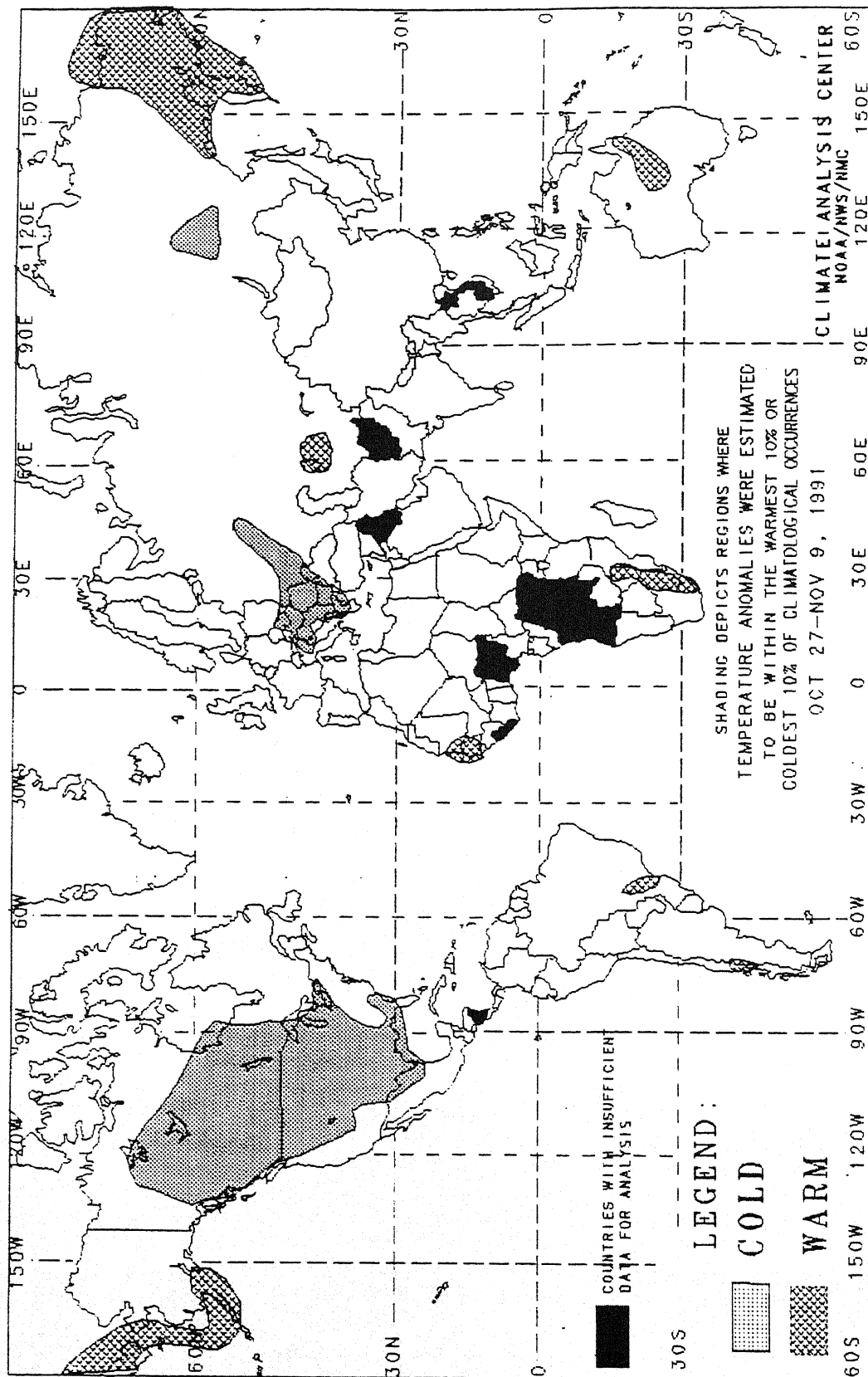


Tropical Storm Thelma slowly tracked through the central Philippines, including the islands of Negros and Leyte, dumping up to 165 mm of rains on some locations. Daily totals of up to 140 mm pelted the mountains of northern Leyte (denuded by years of logging activity), generating severe flash floods and mudslides. At least 5000 individuals are believed to have lost their lives due to Thelma, primarily in the northern Leyte logging port of Ormoc. Thelma became the most deadly natural disaster to affect the Philippines since a 1976 tsunami took more than 8000 lives in Mindanao. Elsewhere, very heavy rains abruptly interrupted the dry spell in Sumatra and western Java. Western coastal locations on Sumatra received up to 255 mm of rain while western sections of Java were soaked with 50-135 mm. In contrast, little relief from drought conditions was experienced farther east as only scattered rainfall amounts of 10-75 mm dampened eastern Java, Borneo, and Celebes. Little or no rain fell across the Moluccas, the eastern Sundas, and Irian Jaya. Farther north, a relatively dry week allowed moisture surpluses to decline across southeast Asia. Most locations north of the Malay Peninsula recorded only 10-30 mm of rain, although 70-90 mm soaked a small section of coastal central Vietnam that was brushed by the remnants of Thelma later in the week.



# 2-WEEK GLOBAL TEMPERATURE ANOMALIES

OCTOBER 27 - NOVEMBER 9, 1991



The anomalies on this chart are based on approximately 2500 observing stations for which at least 13 days of temperature observations were received from synoptic reports. Many stations do not operate on a twenty-four hour basis so many night time observations are not taken. As a result of these missing observations the estimated minimum temperature may have a warm bias. This in turn may have resulted in an overestimation of the extent of some warm anomalies.

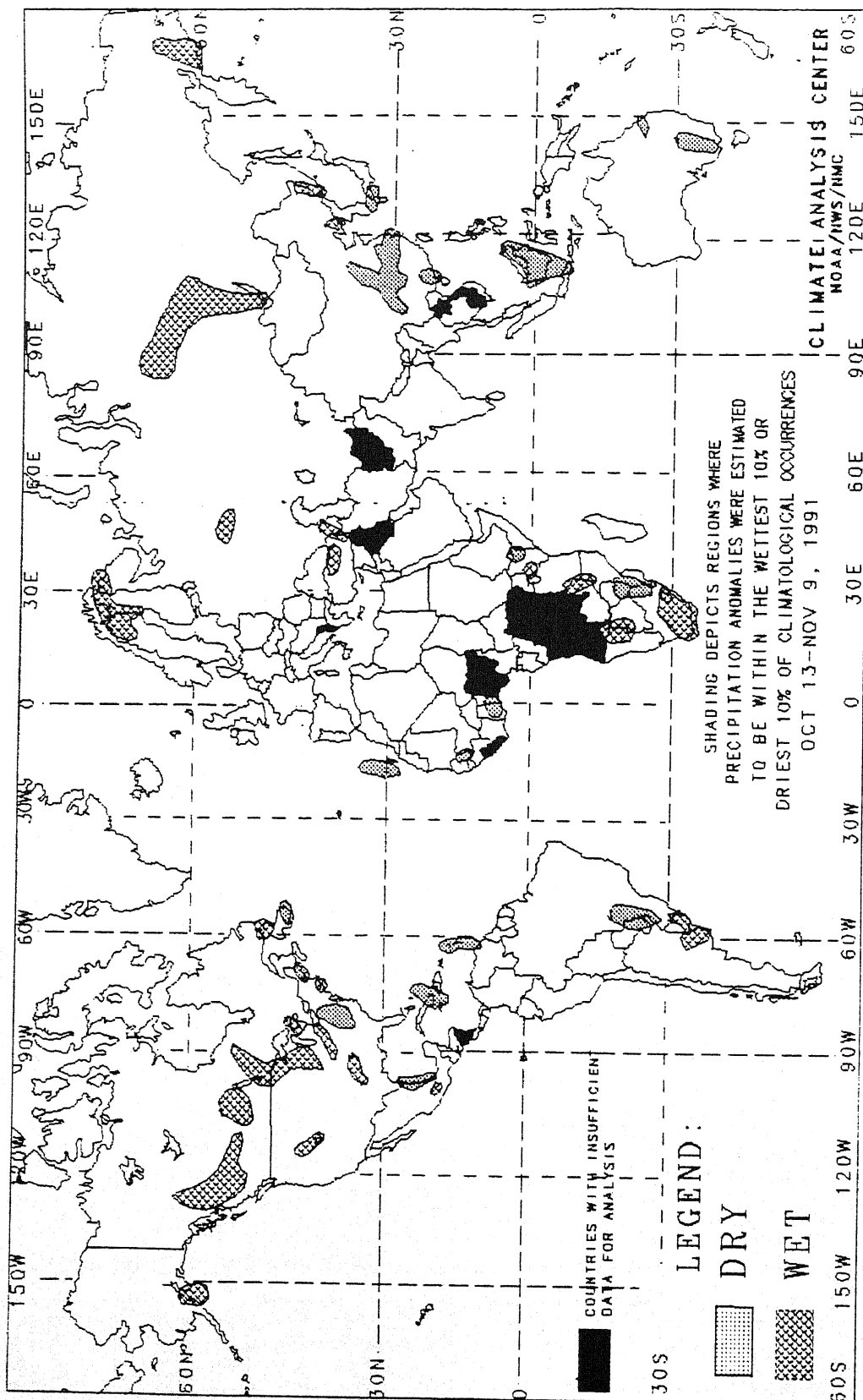
Temperature anomalies are not depicted unless the magnitude of temperature departures from normal exceeds 1.5°C.

In some regions, insufficient data exist to determine the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South America, and along the Arctic Coast. Either current data are too sparse or incomplete for analysis, or historical data are insufficient for determining percentiles, or both. No attempt has been made to estimate the magnitude of anomalies in such regions.

This chart shows general areas of two week temperature anomalies. Caution must be used in relating it to local conditions, especially in mountainous regions.

# 4-WEEK GLOBAL PRECIPITATION ANOMALIES

OCTOBER 13 – NOVEMBER 9, 1991



The anomalies on this chart are based on approximately 2500 observing stations for which at least 27 days of precipitation observations (including zero amounts) were received or estimated from synoptic reports. As a result of both missing observations and the use of estimates from synoptic reports (which are conservative), a dry bias in the total precipitation amount may exist for some stations used in this analysis. This in turn may have resulted in an overestimation of the extent of some dry anomalies.

In climatologically arid regions where normal precipitation for the four week period is less than 20 mm, dry anomalies are not depicted. Additionally, wet anomalies for such arid regions are not depicted unless the total four week precipitation exceeds 50 mm.

In some regions, insufficient data exist to determine the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South America, and along the Arctic Coast. Either current data are too sparse or incomplete for analysis, or historical data are insufficient for determining percentiles, or both. No attempt has been made to estimate the magnitude of anomalies in such regions.

The chart shows general areas of four week precipitation anomalies. Caution must be used in relating it to local conditions, especially in mountainous regions.



# UNITED STATES MONTHLY CLIMATE SUMMARY

## OCTOBER 1991

October's weather was highlighted by powerful storm systems that brought heavy precipitation to the northern and central Rockies, northern and southeastern Plains, Mississippi Valley, Great Lakes, and Northeast. Intense thunderstorms also drenched southern Florida with torrential rain, causing widespread flooding but providing the Everglades with much needed moisture after three exceptionally dry years. In contrast, dry weather worsened drought conditions in the Northwest, central and southwestern Plains, upper Ohio Valley, central and southern Appalachians, and mid-Atlantic. Anomalous warmth accompanied the dry conditions and contributed to wildfire outbreaks in the northwestern quarter of the nation and in the central and southern Appalachians and Piedmont. Fires were particularly deadly and destructive in the Oakland, CA area taking at least 23 lives and causing an estimated \$5.2 billion in damages. A large Pacific storm during the latter part of the month, however, ushered in cool and wet weather, suppressing the threat of fires in the Western states. Warm and dry conditions also hampered the development of hard red winter wheat in the central and southwestern Plains (see front cover). At month's end, two powerful storms affected the U.S. The first spread heavy snow and bitter cold from the Rockies to the Great Lakes as up to 3 feet of snow and 50 mph winds produced blizzard conditions. Cold air spread into the nation's midsection in the storm's wake, breaking numerous October minimum temperature records (Table 7). The second was a huge Atlantic storm that spread heavy rains and gale-force winds along the coast from Maine to the Carolinas, causing widespread coastal flooding and beach erosion.

Torrential rains in Florida, severe weather in the Great Plains and Midwest, and summer-like heat in the Far West marked the start of October. Slow-moving thunderstorms generated over 10 inches of rain in northeastern Florida, producing extensive flooding. Severe thunderstorms rocked the southern Plains and Midwest where tornadoes caused damage in Illinois and Texas. Hot weather baked much of California and the Pacific Northwest as the mercury soared into triple digits across southern California and northern interior valleys. The hot, dry conditions spread across the Rockies and into the Plains by mid-month. In contrast, unseasonably cold weather spread into the eastern half of the country, with freezing temperatures dipping as far south as Georgia. Torrential rains continued to bombard Florida as up to 15.5 inches soaked Dade County. In Alaska, the first significant snow of the season blanketed the Tanana and Yukon Valleys while heavy rain soaked the southeastern panhandle. Over a foot of rain drenched portions of Oahu, HI as the rainy season in central Hawaii got off to a quick start.

The continuing hot and dry weather in the Far West promoted the rapid spread of wildfires, which burned over 28,000 acres in California, Washington, Oregon, Idaho, Montana, and Wyoming. Over a hundred homes were incinerated in the Spokane, WA area, and over two thousand were burned down in the Oakland and Berkeley, CA vicinity. At least 23 deaths were attributable to the fire. The Oakland fire was the second costliest natural disaster in U.S. history behind Hurricane Hugo in terms of insurable losses. During the latter part of October, the season's first major storm system spread moderate to heavy precipitation across the Pacific Northwest, Rockies, and Great Plains. Up to 18 inches of snow fell near Cody, WY while low temperatures combined with strong winds to produce sub-zero wind chills in North Dakota and Montana. Strong thunderstorms soaked portions of Texas, Oklahoma, Arkansas, and Florida with heavy rain. At month's end, a massive storm buried the northern Great Plains and upper Mississippi Valley from the Dakotas to

Wisconsin under heavy snow, forcing road closures. Over 28 inches blanketed Minneapolis/St. Paul, MN, establishing a new single-storm record, while three feet of snow buried Duluth, MN. Wind chills down to -45°F stung the Great Plains as single digit temperatures dipped as far south as northern Texas. Elsewhere, a huge Atlantic storm caused flooding and beach erosion from the Carolinas to Maine. Numerous beach homes were damaged or destroyed, including Presidents Bush's home in Kennebunkport, ME. Over a foot of rain drenched Kodiak, AK, causing floods and mudslides.

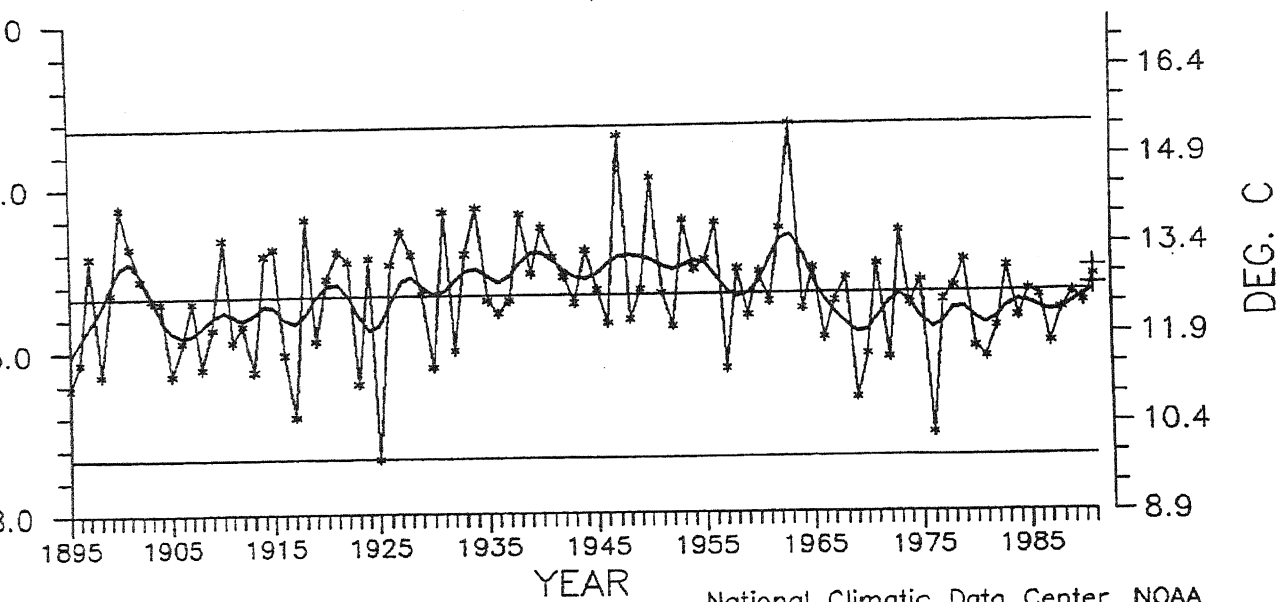
According to the River Forecast Centers, the greatest monthly precipitation totals (more than 6 inches) fell from north central Texas to western Arkansas and over portions of the upper Great Lakes, northern New England, northern Louisiana, southern Florida, southern Alaska, and Oahu in the Hawaiian Islands (Table 1). Miami, FL accumulated 21.64 inches, the highest October total since records began in 1947. Record totals also fell on a number of stations in the Midwest (Table 6). Above normal precipitation prevailed over much of the Mississippi Valley, the southeastern and northern Plains, the Great Lakes, New England, Florida, the northern and central Rockies, the Great Basin, California, and Alaska (Figure 2). According to the National Climatic Data Center, the East North Central region recorded their 17th wettest October in 1991 (page 11). During the first ten months of the year, eight states (AL, FL, GA, LA, MN, MS, SC, and TX) recorded one of the ten wettest January - October periods since 1895. January - October 1991 ranked as the 29th wettest such period nationally, according to the precipitation index (page 18).

Abnormally dry conditions (below 75% of normal precipitation) prevailed over the northern Pacific coast, southern Rockies, central and southwestern Plains, Southeast, mid-Atlantic, upper Ohio Valley, Hawaii (with the exception of Oahu), extreme northern Alaska, and portions of the Intermountain West and northern Plains (Figure 2). Parts of the Southeast and central Appalachians and Piedmont were extremely dry, receiving less than 25% of the normal precipitation (page 13). Regionally, the Northwest had the tenth driest October in 1991 while the Southeast experienced the 16th driest during the last 97 years (page 11). During January - October, 1991, three states (PA, MD, and WV) had one of the ten driest such periods on record (page 18).

Despite cooler conditions at month's end, abnormally high monthly temperatures were again recorded in the Far West, where departures reached up to 6°F in interior California and the desert Southwest (Figure 4). Temperatures also averaged above normal over much of the south-central states, from the Mississippi River eastward, and across Hawaii and Alaska. Regionally, the West had the 8th warmest October on record (page 11). For the nation as a whole, the first 10 months of the year were unusually warm, with the January - October period ranking as the ninth warmest such period on record. Not surprisingly, twenty five states recorded one of the ten warmest January - October periods on record in 1991 (page 17).

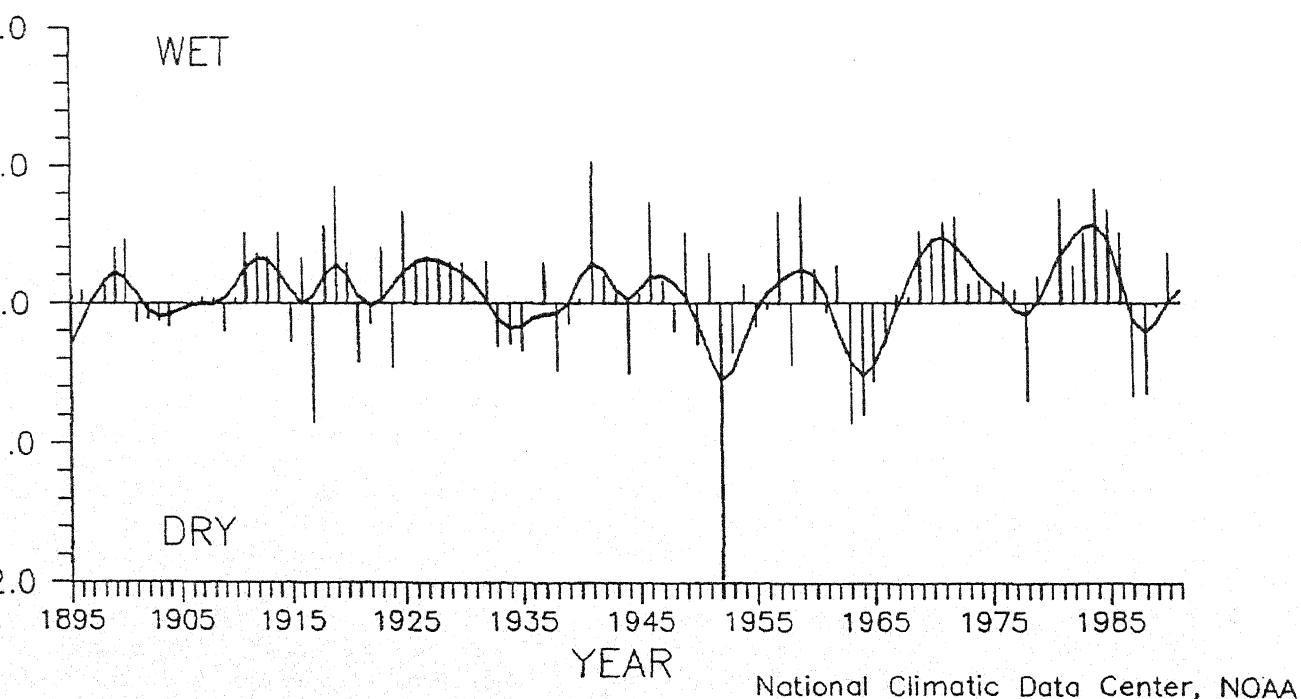
Subnormal October temperatures (more than 2°F below normal) were limited to the north-central states and portions of northern Florida and southeastern Alaska. An intrusion of bitter Arctic air toward the end of the month caused temperatures to average as much as 6°F below normal from eastern Montana to northern Minnesota (page 15). Regionally, the West North Central and the East North Central experienced the 21st and 28th coldest October, respectively, on record (page 11).

# U.S. NATIONAL TEMPERATURE OCTOBER, 1895-1991



ally Averaged October Temperatures 1895 - 1991, as Computed by the National Climatic Data Center.  
1991, averaged just above the long-term mean nationwide (41st warmest). The 1991 value is based on preliminary data and  
e within 0.26°F of the final data.

# U.S. NATIONAL MEAN PRECIPITATION INDEX OCTOBER, 1895-1991

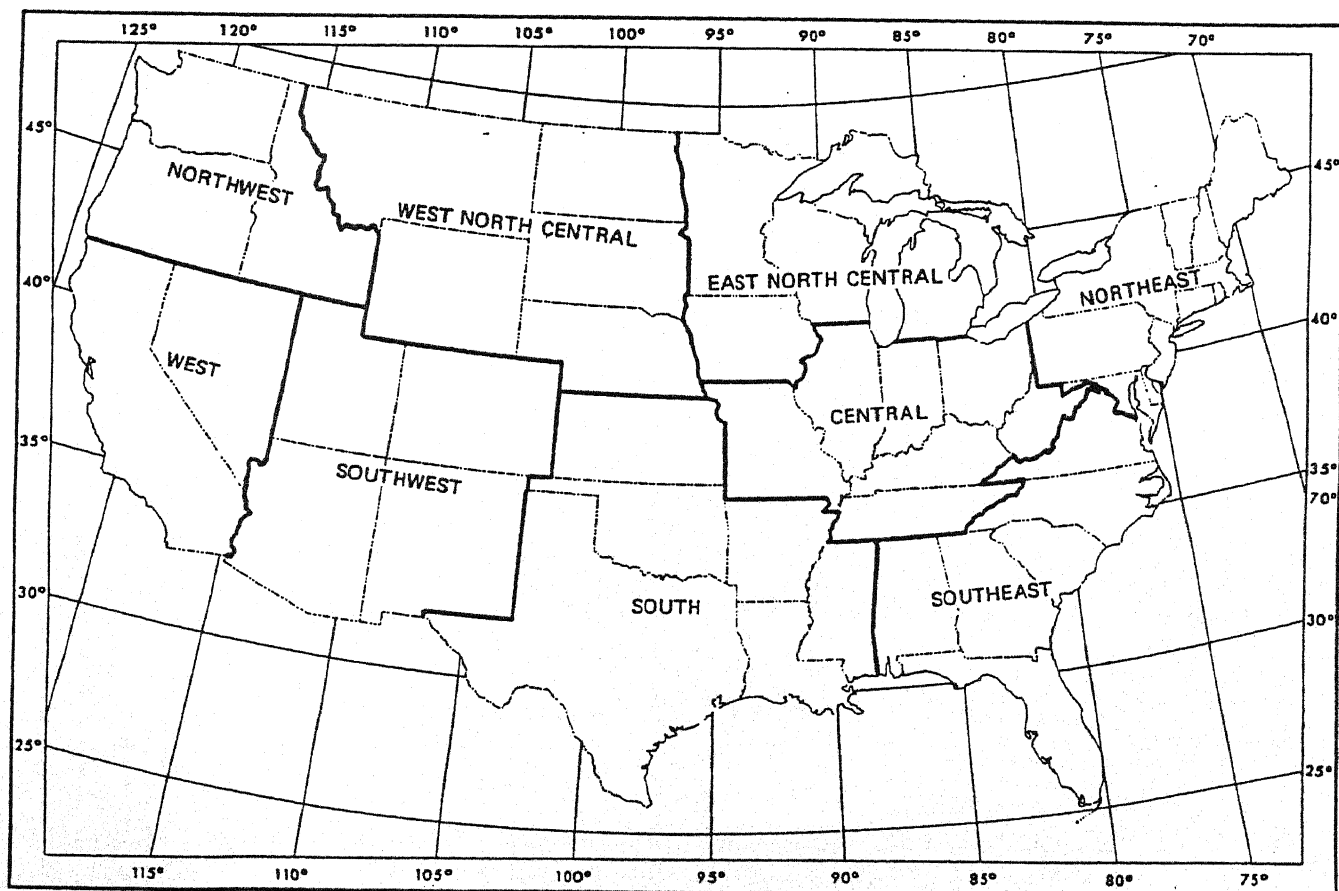


al Mean October Precipitation Index, 1895-1991, as Computed by the National Climatic Data Center.  
1991 ranked as 36th driest October on record. This index takes local normals into account so that typically wet regions do not  
e the index value. Only 3 of the last 25 Octobers brought significantly below normal precipitation to the country.

**TEMPERATURE AND PRECIPITATION RANKINGS FOR  
OCTOBER 1991, BASED ON THE PERIOD 1895 TO 1991.  
1 = DRIEST/COLDEST AND 97 = WETTEST/HOTTEST.**

<u>REGION</u>	<u>PRECIPITATION</u>	<u>TEMPERATURE</u>
NORTHEAST	43	63
EAST NORTH CENTRAL	81	29
CENTRAL	77	62
SOUTHEAST	16	56
WEST NORTH CENTRAL	38	21
SOUTH	64	65
SOUTHWEST	40	75
NORTHWEST	10	35
WEST	45	90
NATIONAL	36	57

*National Climatic Data Center*

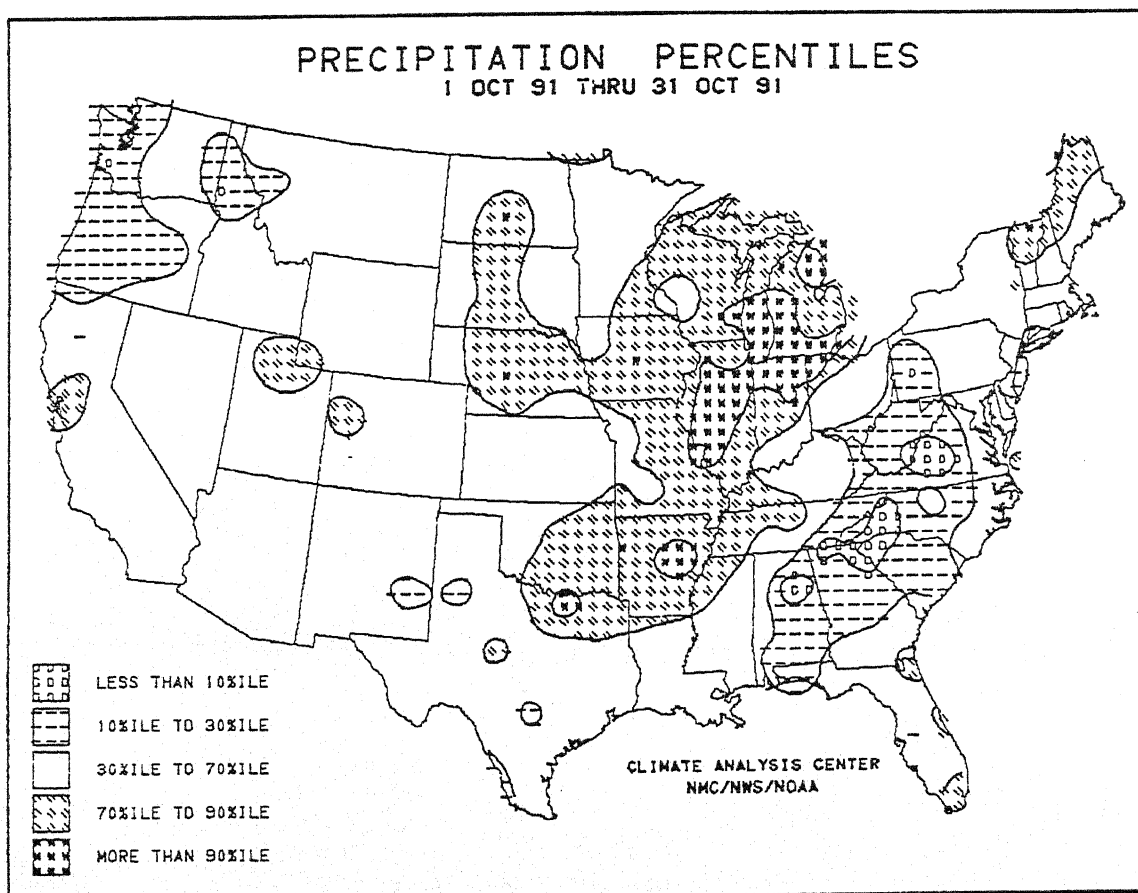


**The Nine U.S. Regional Boundaries as Defined by the National Climatic Data Center (NCDC) and Regularly Used in the Monthly and Seasonal U.S. Climatic Summaries.**

**TABLE 1. SELECTED STATIONS WITH 150% OR MORE OF THE NORMAL PRECIPITATION AND 6.00 INCHES OR MORE PRECIPITATION; OR, STATIONS WITH 8.00 INCHES OR MORE PRECIPITATION AND NO NORMALS DURING OCTOBER 1991.**

<u>STATION</u>	<u>TOTAL</u> (INCHES)	<u>PCT. OF</u> <u>NORMAL</u>	<u>STATION</u>	<u>TOTAL</u> (INCHES)	<u>PCT. OF</u> <u>NORMAL</u>
MIAMI, FL	21.64	303.9	STEPHENVILLE, TX	8.20	***
HOMESTEAD AFB, FL	14.87	***	FAYETTEVILLE, AR	8.17	246.1
ILIAMNA, AK	11.09	373.4	LITTLE ROCK, AR	7.83	277.7
KEY WEST NAS, FL	10.76	***	PINE BLUFF, AR	7.70	242.9
MONROE, LA	10.48	433.1	CHICAGO/O'HARE, IL	7.36	371.7
HOUGHTON LAKE, MI	9.86	432.5	MUSKEGON, MI	7.33	265.6
HARRISON, AR	9.74	306.3	PEORIA, IL	7.31	290.1
FT WORTH/CARSWELL AFB, TX	9.48	***	PELLSTON, MI	7.29	280.4
DALLAS-FT WORTH, TX	9.32	310.7	DALLAS/LOVE FIELD, TX	7.23	215.2
FT WAYNE, IN	8.94	349.2	MILWAUKEE, WI	7.03	316.7
FT SMITH, AR	8.84	274.5	ALPENA, MI	6.53	315.5
SOUTH BEND, IN	8.75	273.4	SPRINGFIELD, IL	6.41	245.6
MCALESTER, OK	8.57	219.7	JACKSONVILLE, FL	6.36	166.9

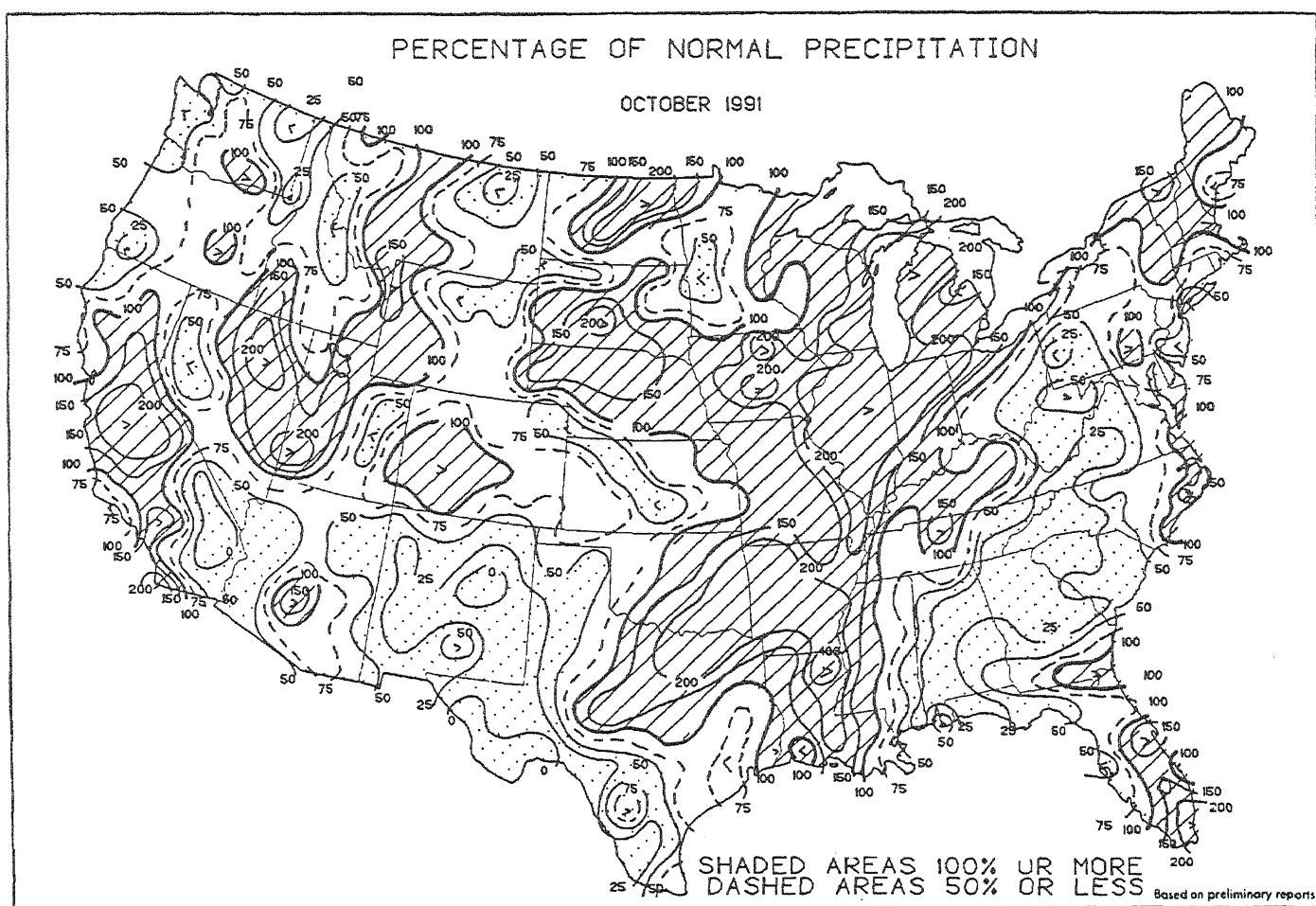
NOTE: Stations without precipitation normals are indicated by asterisks.



**FIGURE 1.** October 1991 Precipitation Percentiles. Significant October dryness [ $<30\%$ ile] was observed in the Pacific Northwest, Southeast, mid-Atlantic, and upper Ohio Valley. Exceptionally low precipitation totals [ $10\%$ ile] were measured in the central and southern Appalachians and Piedmont. In contrast, abnormally wet weather [ $70\%$ ile] affected the nation's mid-section and portions of west-central California, central Rockies, northern New England, and Florida.

**TABLE 2. SELECTED STATIONS WITH 50% OR LESS OF THE NORMAL PRECIPITATION AND NORMAL PRECIPITATION OF 3.00 INCHES OR MORE DURING OCTOBER 1991.**

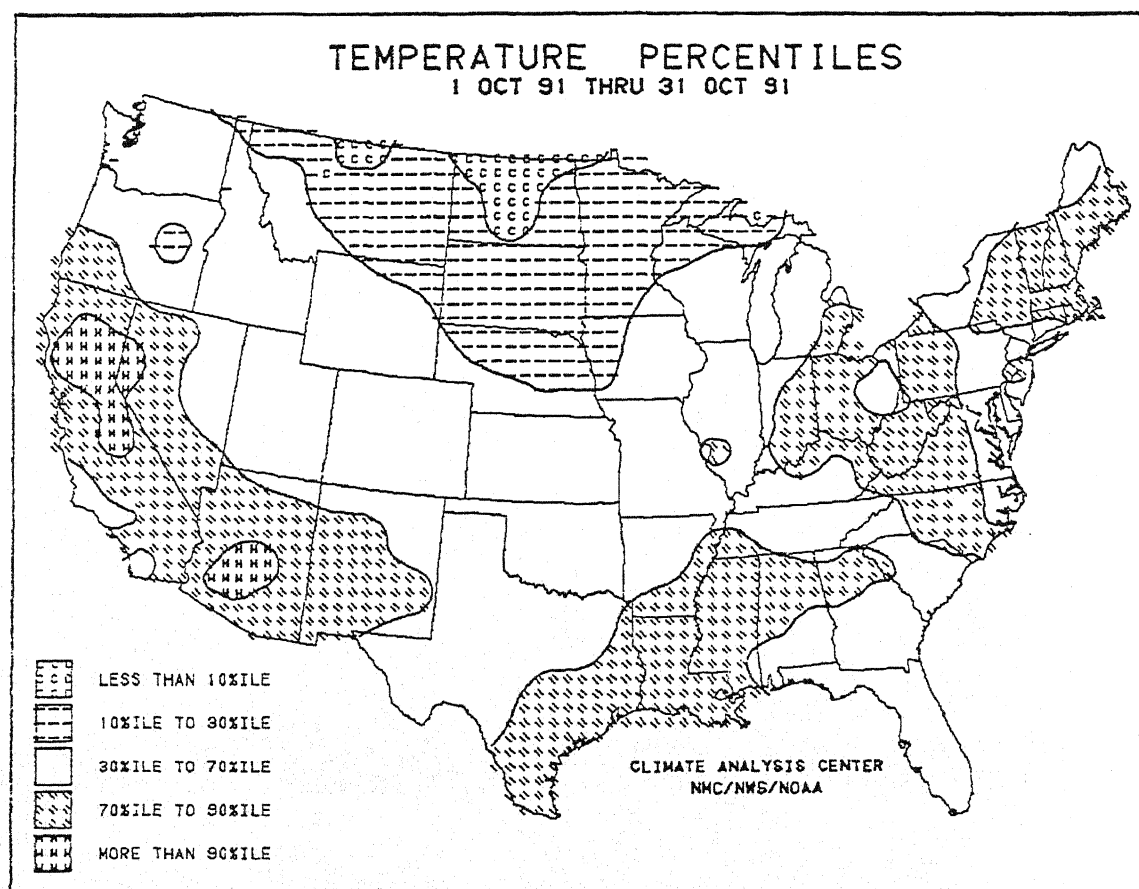
STATION	TOTAL (INCHES)	PCT. OF NORMAL	NORMAL (INCHES)	STATION	TOTAL (INCHES)	PCT. OF NORMAL	NORMAL (INCHES)
ROANOKE, VA	0.04	1.2	3.45	NEWARK/INTL, NJ	1.28	41.7	3.07
ASHEVILLE, NC	0.19	6.1	3.13	SEATTLE-TACOMA, WA	1.30	38.0	3.42
HICKORY, NC	0.21	6.2	3.41	ATLANTIC CITY, NJ	1.36	44.7	3.04
GREENVILLE, SC	0.24	7.0	3.42	WASHINGTON/DULLES, VA	1.37	42.3	3.24
SEXTON SUMMIT, OR	0.46	14.6	3.15	GAINESVILLE, FL	1.41	42.9	3.29
BILOXI/KEESLER AFB, MS	0.46	14.5	3.18	PORTLAND, OR	1.51	49.8	3.03
PENSACOLA, FL	0.55	14.9	3.69	ROME/GRIFFISS AFB, NY	1.54	42.9	3.59
LYNCHBURG, VA	0.62	18.4	3.37	OLYMPIA, WA	2.20	47.0	4.68
HOMER, AK	0.97	29.6	3.28	ASTORIA, OR	2.31	37.1	6.22
NORTH BEND, OR	0.97	21.9	4.43	QUILLAYUTE, WA	2.66	25.5	10.42
APALACHICOLA, FL	0.98	30.7	3.19	ADAK, AK	3.35	50.0	6.70
BELLINGHAM, WA	1.08	30.9	3.49	STAMPEDE PASS, WA	3.72	48.1	7.74
NEW YORK/LA GUARDIA, NY	1.22	37.9	3.22				



**FIGURE 2.** October 1991 Percent of Normal Precipitation. *Isopleths drawn for 0, 25, 50, 75, 100, 150, 200, and 400 percent. Precipitation was abnormally heavy across much of the southeastern and northern Plains, Mississippi Valley, Great Lakes, Northeast, and southern Florida. An early season storm also brought above normal rains to California and the Great Basin, where October precipitation totals are typically low. Abnormally dry conditions prevailed in much of the Southeast, mid-Atlantic, upper Ohio Valley, central and southwestern Plains, southern Rockies, northern High Plains and Pacific Northwest, where less than half of normal precipitation was measured.*

**TABLE 3. OCTOBER 1991 AVERAGE TEMPERATURE 4.5°F OR MORE ABOVE NORMAL.**

STATION	DEPARTURE (°F)	AVERAGE (°F)	STATION	DEPARTURE (°F)	AVERAGE (°F)
VICTORVILLE/GEORGE AFB, CA	+8.5	69.5	STOCKTON, CA	+5.2	69.5
PHOENIX, AZ	+6.8	80.2	NOME, AK	+5.2	33.4
SAN BERNARDINO/NORTON, CA	+6.6	71.9	DAGGETT, CA	+5.0	73.9
RENO, NV	+6.5	56.7	SACRAMENTO, CA	+5.0	68.9
KOTZEBUE, AK	+6.1	29.3	PASO ROBLES, CA	+5.0	67.0
GLENDALE/LUKE AFB, AZ	+5.8	76.7	MARYSVILLE/YUBA CO, CA	+4.9	69.6
FRESNO, CA	+5.8	70.5	YUMA, AZ	+4.7	81.0
BETHEL, AK	+5.8	35.9	ANIAK, AK	+4.6	34.7
BURBANK/HOLLYWOOD, CA	+5.6	71.4	LAS VEGAS, NV	+4.5	72.1
RED BLUFF, CA	+5.6	70.8	MT SHASTA, CA	+4.5	56.0
BLUE CANYON, CA	+5.4	59.5			

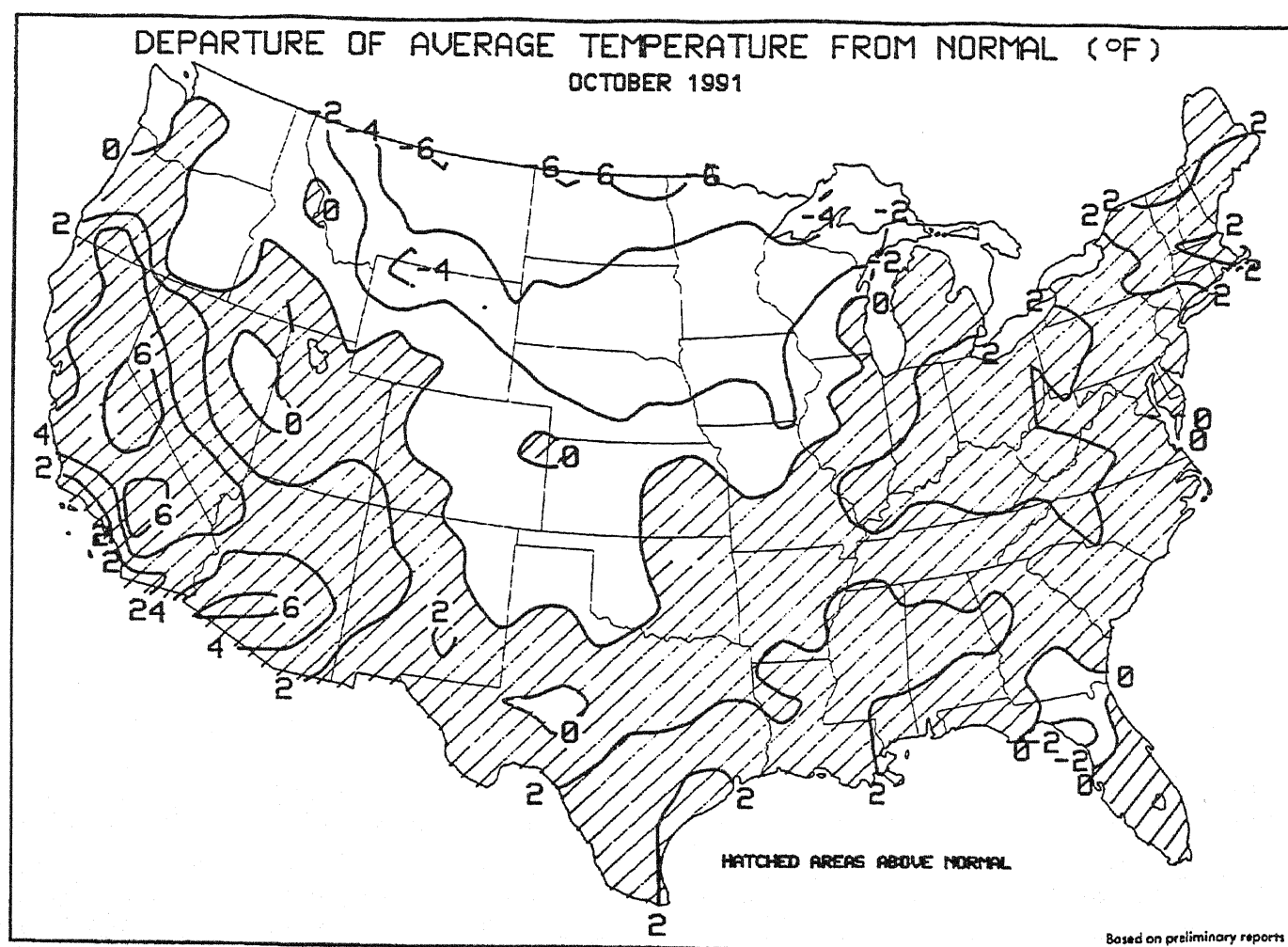


**FIGURE 3.** September 1991 Temperature Percentiles. *Significant October warmth [ $>70\%$ ile] covered much of the Far West, Southwest, south-central states, Ohio Valley, mid-Atlantic, and Northeast. Northern California and central Arizona were particularly warm, ranking in the upper 10 percent of the historical distribution. Unusual coolness [ $<30\%$ ile] was observed across the north-central States.*



**TABLE 4. OCTOBER 1991 AVERAGE TEMPERATURE 4.0°F OR MORE BELOW NORMAL.**

<u>STATION</u>	<u>DEPARTURE</u> (°F)	<u>AVERAGE</u> (°F)	<u>STATION</u>	<u>DEPARTURE</u> (°F)	<u>AVERAGE</u> (°F)
WARROAD, MN	-7.1	36.7	WILLISTON, ND	-4.9	40.8
DEVIL'S LAKE, ND	-7.1	38.0	MILES CITY, MT	-4.9	43.5
HAVRE, MT	-6.5	39.9	CODY, WY	-4.9	43.7
GULKANA, AK	-6.4	21.1	INTERNATIONAL FALLS, MN	-4.7	38.1
GRAND FORKS, ND	-5.6	39.4	JAMESTOWN, ND	-4.5	41.1
GREAT FALLS, MT	-5.6	42.4	GLASGOW, MT	-4.3	41.9
MINOT, ND	-5.4	40.0	FARGO, ND	-4.3	42.1
BISMARCK, ND	-5.4	40.6	FT DODGE, IA	-4.1	47.9
DICKINSON, ND	-5.1	41.0	HANCOCK/HOUGHTON CO, MI	-4.0	40.9
LEWISTOWN, MT	-4.9	40.4	WATERTOWN, SD	-4.0	42.9



**FIGURE 4.** October 1991 Departure of Average Temperature from Normal (°F). *Isopleths drawn only for -6°F, -4°F, -2°F, 0°F, 2°F, 4°F and 6°F. Warmer than normal conditions encompassed much of the nation, with monthly departures reaching +6°F in California and Arizona. In contrast, unusually cool conditions covered the north central states and a small portion of northern Florida.*

**TABLE 5. RECORD OCTOBER PRECIPITATION.**

<u>STATION</u>	<u>TOTAL</u> (INCHES)	<u>NORMAL</u> (INCHES)	<u>PCT. OF</u> <u>NORMAL</u>	<u>RECORD</u> <u>TYPE</u>	<u>RECORDS</u> <u>BEGAN</u>
Miami, FL	21.64	7.12	303.9	HIGHEST	1947
Houghton Lake, MI	9.86	2.28	432.5	HIGHEST	1964
Chicago/O'Hare, IL	7.36	1.98	371.7	HIGHEST	1959
Muskegon, MI	7.33	2.76	265.6	HIGHEST	1951
Milwaukee, WI	7.03	2.22	316.7	HIGHEST	1947
Alpena, MI	6.53	2.07	315.5	HIGHEST	1960
Springfield, IL	6.41	2.61	245.6	HIGHEST	1948
Toledo, OH	5.53	1.93	286.5	HIGHEST	1956
Greenville, SC	0.24	3.42	7.0	LOWEST	1963
Chattanooga, TN	0.22	2.92	7.5	LOWEST	1940
Asheville, NC	0.19	3.41	6.2	LOWEST	1965
Birmingham, AL	0.07	2.61	2.7	LOWEST	1944
Roanoke, VA	0.04	3.45	1.2	LOWEST	1947

NOTE: Trace precipitation is considered ZERO precipitation. Stations with no precipitation are only included if normal precipitation is 0.25 inches or more.

**TABLE 6. RECORD OCTOBER AVERAGE TEMPERATURES.**

<u>STATION</u>	<u>AVERAGE</u> (°F)	<u>NORMAL</u> (°F)	<u>DEPARTURE</u> (°F)	<u>RECORD</u> <u>TYPE</u>	<u>RECORDS</u> <u>BEGAN</u>
Fresno, CA	70.5	64.8	+5.8	HIGHEST	1947
Sacramento, CA	68.9	63.9	+5.0	HIGHEST	1878

**TABLE 7. RECORD OCTOBER EXTREME TEMPERATURES.**

<u>STATION</u>	<u>EXTREME</u> (°F)	<u>DATE</u>	<u>RECORD</u> <u>TYPE</u>	<u>RECORDS</u> <u>BEGAN</u>
San Antonio, TX	99	Oct 12	HIGHEST	1940
Victoria, TX	99	Oct 12	HIGHEST	1961
Austin, TX	98	Oct 12	HIGHEST	1942
Houston, TX	96	Oct 12	HIGHEST	1970
Denver, CO	89	Oct 16	HIGHEST	1935
Huntington, WV	86	Oct 26	HIGHEST	1962
Galveston, TX	33	Oct 31	LOWEST	1871
Midland, TX	26	Oct 31	LOWEST	1949
Albuquerque, NM	21	Oct 31	LOWEST	1940
Lubbock, TX	20	Oct 31	LOWEST	1947
Dodge City, KS	17	Oct 31	LOWEST	1941
Amarillo, TX	15	Oct 31	LOWEST	1941
Roswell, NM	15	Oct 31	LOWEST	1973
Spokane, WA	10	Oct 31	LOWEST	1948
North Platte, NE	10	Oct 29	LOWEST	1948
Kalispell, MT	-1	Oct 30	LOWEST	1950
Valentine, NE	-1	Oct 31	LOWEST	1956
Cheyenne, WY	-1	Oct 31	LOWEST	1935
Rapid City, SD	-2	Oct 31	LOWEST	1943
Williston, ND	-3	Oct 30	LOWEST	1962
Ely, NV	-3	Oct 31	LOWEST	1939
Lander, WY	-3	Oct 31	LOWEST	1947
Glasgow, MT	-6	Oct 30	LOWEST	1955
Scottsbluff, NE	-6	Oct 31	LOWEST	1943
Billings, MT	-7	Oct 30	LOWEST	1935
Helena, MT	-8	Oct 30	LOWEST	1941
Miles City, MT	-8	Oct 30	LOWEST	1938
Bismarck, ND	-10	Oct 31	LOWEST	1940
Great Falls, MT	-11	Oct 30	LOWEST	1938
Sheridan, WY	-11	Oct 31	LOWEST	1940
Havre, MT	-21	Oct 29	LOWEST	1961

**PRECIPITATION RANKINGS FOR JAN-OCT 1991, BASED ON THE PERIOD 1895 TO 1990. 1 = DRIEST, 97 = WETTEST.**

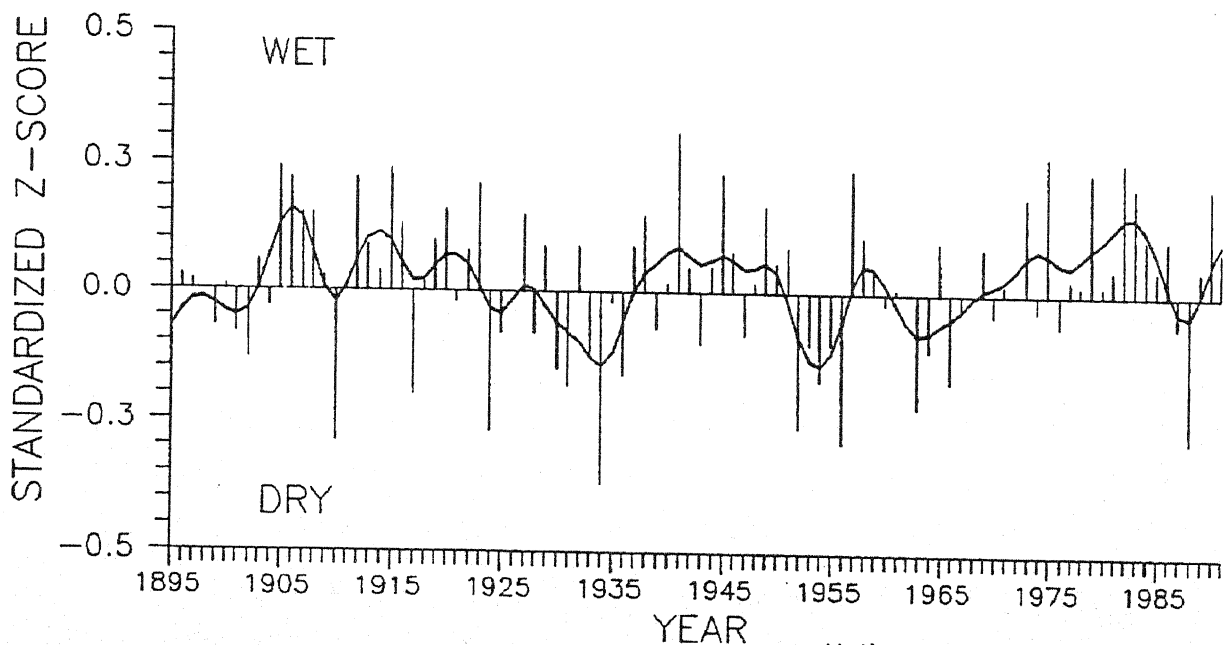
<i>STATE</i>	<i>RANK</i>	<i>STATE</i>	<i>RANK</i>	<i>STATE</i>	<i>RANK</i>	<i>STATE</i>	<i>RANK</i>
AL	<b>89</b>	IA	78	NE	38	RI	71
AZ	27	KS	12	NV	56	SC	<b>83</b>
AR	83	KY	28	NH	61	SD	83
CA	51	LA	<b>97</b>	NJ	44	TN	75
CO	65	ME	62	NM	75	TX	<b>88</b>
CT	71	MD	7	NY	18	UT	64
DE	54	MA	75	NC	45	VT	68
FL	<b>95</b>	MI	80	ND	74	VA	20
GA	<b>91</b>	MN	<b>91</b>	OH	10	WA	50
ID	21	MS	<b>96</b>	OK	66	WV	7
IL	40	MO	21	OR	30	WI	74
IN	22	MT	75	PA	4	WY	64

*National Climatic Data Center*

Top 10 rankings : **BOLD**

Bottom 10 rankings : *Italics*

**U.S. NATIONAL MEAN PRECIPITATION INDEX  
JANUARY-OCTOBER, 1895-1991**



National Climatic Data Center, NOAA

January - October Mean Precipitation Index, 1895-1991, as Computed by the National Climatic Data Center. *January through October 1991 measured above the median precipitation (29th wettest such period on record). This index takes local normals into account, so that typically wet areas do not dominate the index value. This is the third consecutive year with above median January - October precipitation.*

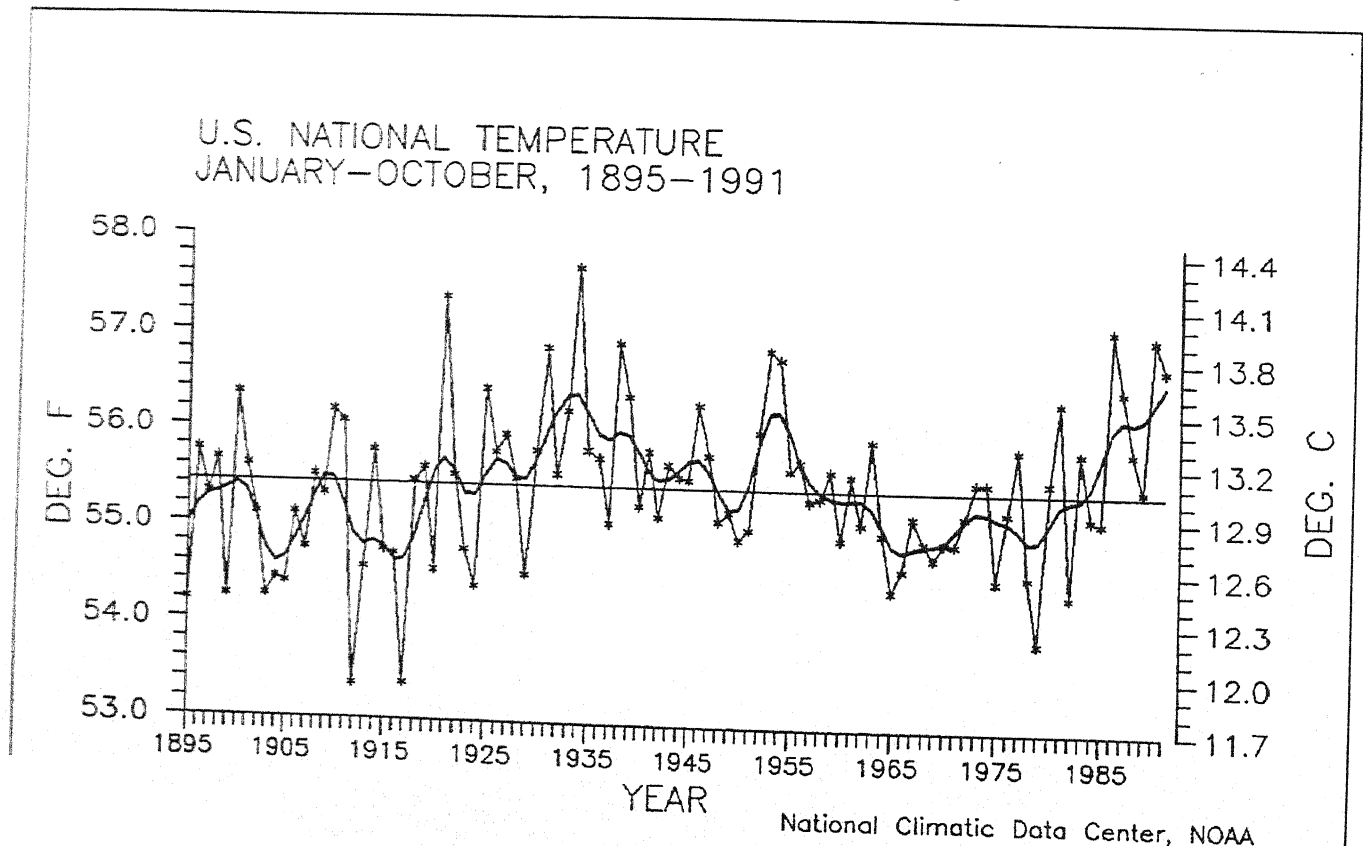
**TEMPERATURE RANKINGS FOR JAN-OCT 1991, BASED ON THE PERIOD 1895 TO 1991. 1 = COLDEST AND 97 = WARMEST.**

<u>STATE</u>	<u>RANK</u>	<u>STATE</u>	<u>RANK</u>	<u>STATE</u>	<u>RANK</u>	<u>STATE</u>	<u>RANK</u>
AL	73	IA	84	NE	86	RI	<b>96</b>
AZ	72	KS	<b>88</b>	NV	69	SC	84
AR	76	KY	<b>96</b>	NH	<b>95</b>	SD	<b>90</b>
CA	71	LA	73	NJ	<b>96</b>	TN	82
CO	70	ME	71	NM	35	TX	57
CT	97	MD	<b>97</b>	NY	<b>95</b>	UT	54
DE	<b>95</b>	MA	<b>94</b>	NC	<b>94</b>	VT	<b>93</b>
FL	<b>95</b>	MI	<b>91</b>	ND	<b>93</b>	VA	<b>95</b>
GA	78	MN	<b>90</b>	OH	<b>96</b>	WA	74
ID	74	MS	73	OK	83	WV	<b>95</b>
IL	<b>91</b>	MO	<b>88</b>	OR	70	WI	<b>89</b>
IN	<b>96</b>	MT	86	PA	<b>96</b>	WY	85

*National Climatic Data Center*

Top 10 rankings : **BOLD**

Bottom 10 rankings : *Italics*



January - October Nationally Averaged Temperatures, 1895-1991, as Computed by the National Climatic Data Center. *The year so far has been unusually warm, ranking as the 9th warmest January - October period on record. January - October temperatures have been above normal for six consecutive years.*

# **EL NIÑO/SOUTHERN OSCILLATION (ENSO) DIAGNOSTIC ADVISORY 91/07**

*issued by*

**DIAGNOSTICS BRANCH  
CLIMATE ANALYSIS CENTER, NMC**

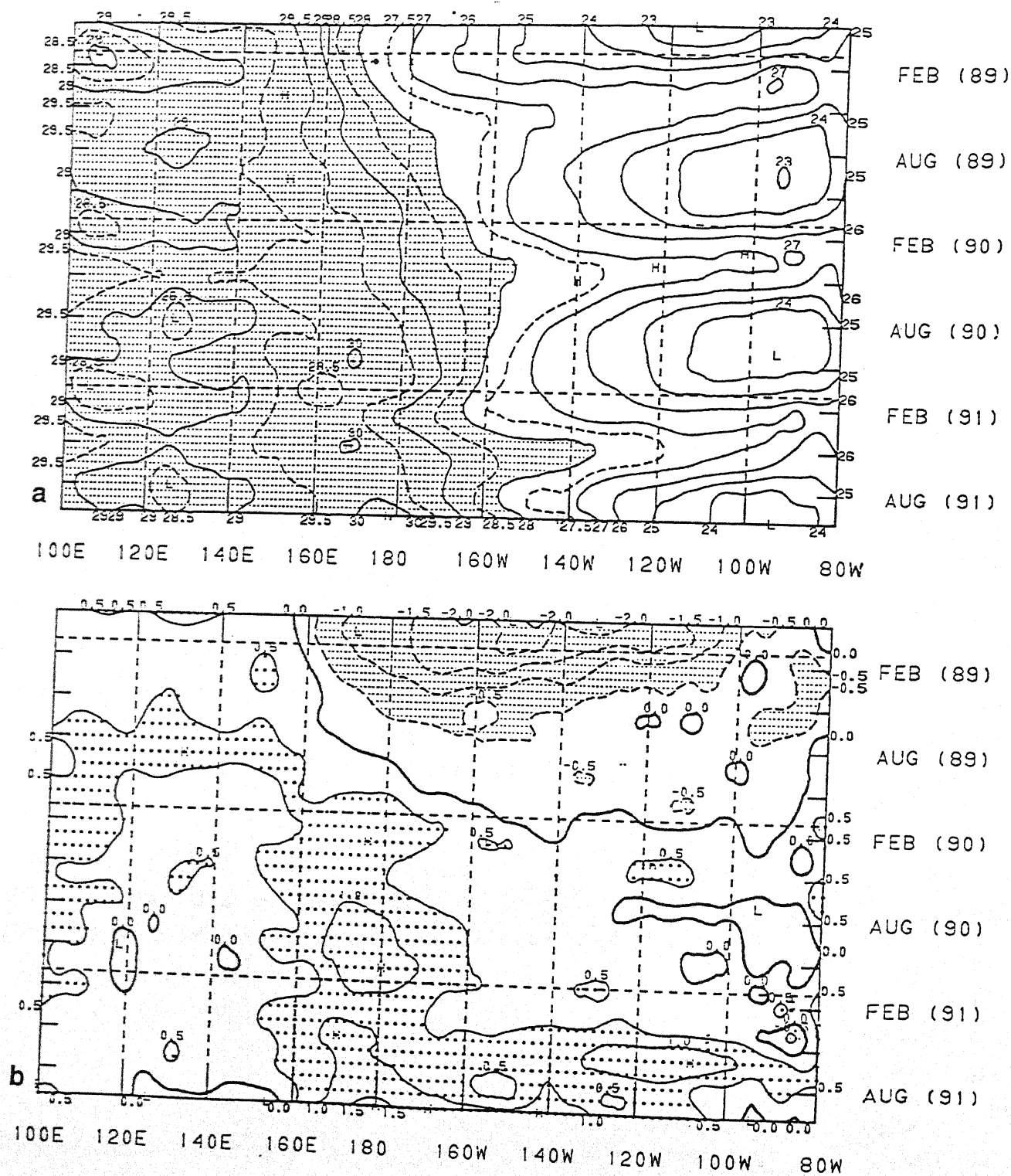
**NOVEMBER 8, 1991**

During October, both surface and subsurface oceanic anomaly patterns showed a strong evolution toward a warm (ENSO) episode. Sea Surface Temperature (SST) anomalies increased and the oceanic thermocline deepened throughout the eastern equatorial Pacific in association with an eastward propagating Kelvin wave (Figs. 1b and 2). At the same time the oceanic thermocline shoaled (became shallower) in the western equatorial Pacific. Similar features were observed in late 1986 as the 1986 – 1987 warm episode developed.

In recent months the warmest water (SST greater than 30°C) has shifted to the equator along the equator at the date line (Fig. 1a). At the same time, low-level equatorial easterlies have weakened, SST anomalies have increased throughout the equatorial Pacific east of the date line (Fig. 1b), and the Southern Oscillation Index (SOI) has been negative. These features are consistent in indicating a warm (ENSO) episode.

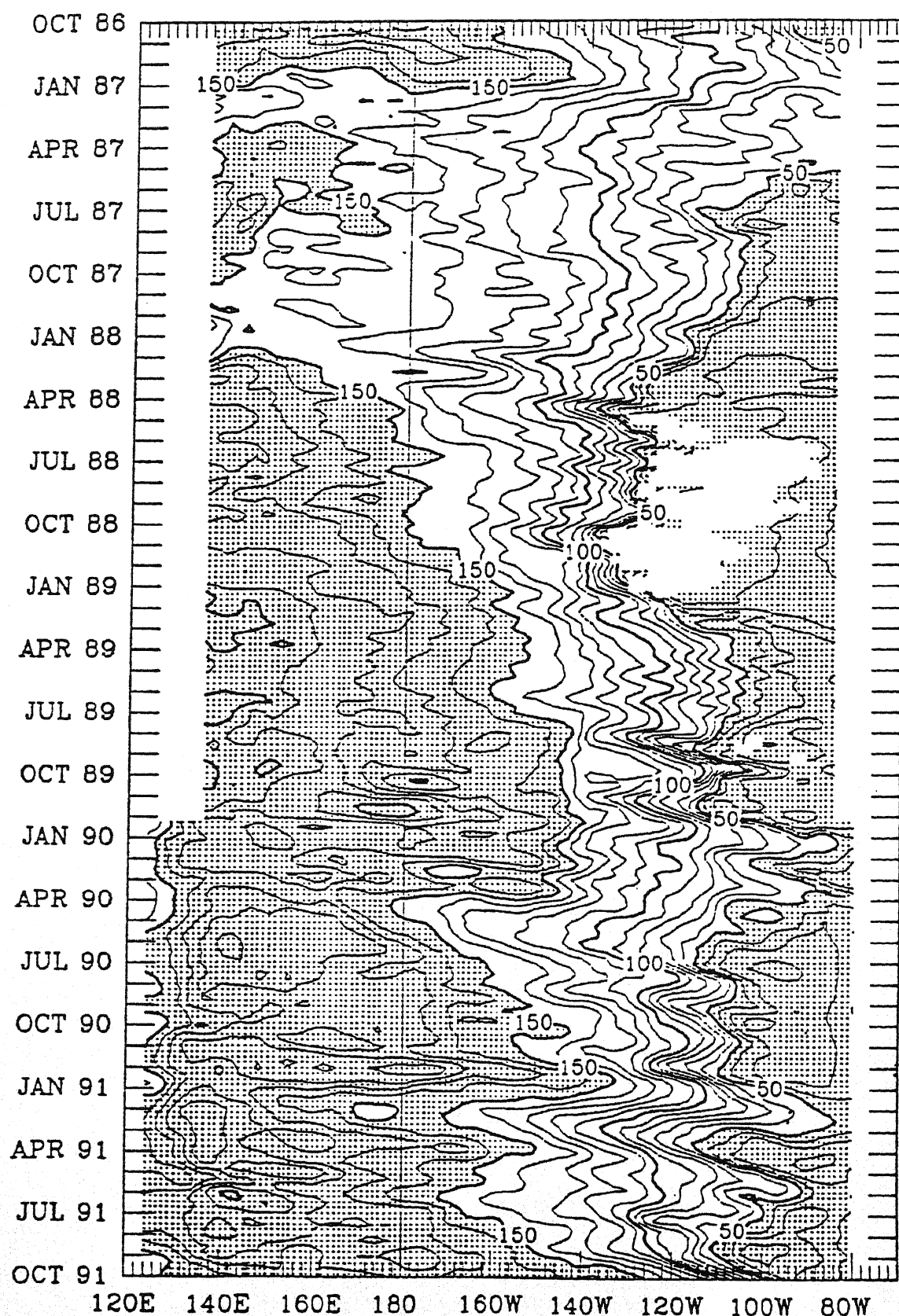
Certain precipitation and circulation anomalies, generally associated with warm episodes, have been observed in recent months. Drier than normal conditions have been observed over Indonesia and sections of northern and eastern Australia. Anomalous subtropical upper-tropospheric anticyclonic circulation has been observed in the South Pacific flanked by an enhanced tropical jetstream in the western and central South Pacific.

If warm episode conditions continue for the next several months, we can expect that ENSO-related temperature, precipitation and circulation anomaly patterns will develop which are consistent with those observed during past warm episodes. The precipitation and temperature anomaly patterns, generally found during warm (ENSO) episodes during the Northern Hemisphere cold season (November – March), are depicted in Fig. 3.



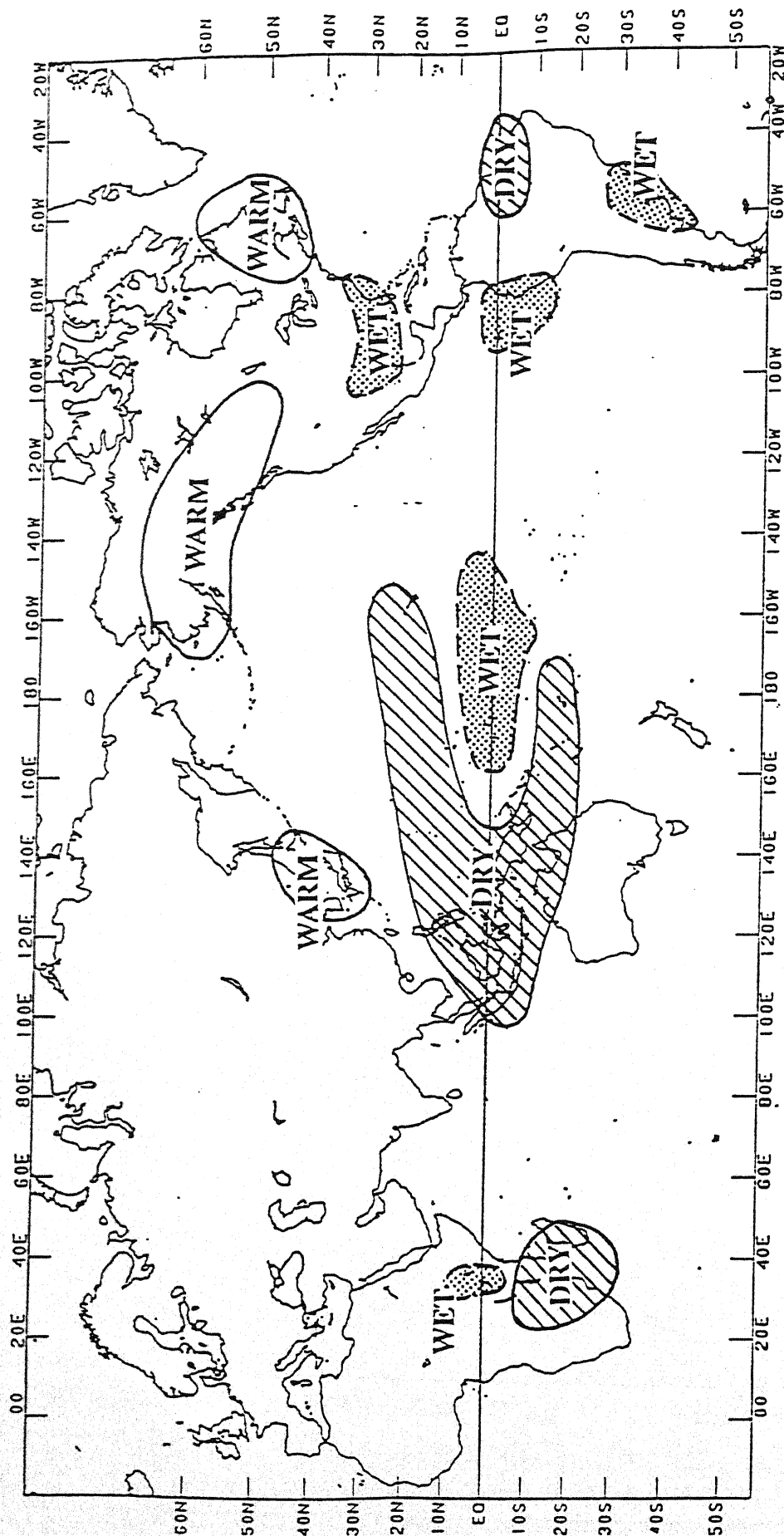
**FIGURE 1.** Time-Longitude Section of Monthly Sea Surface Temperature, a) Mean and b) Anomalous, for 5°N-5°S. Contour interval is 1°C and 0.5°C, respectively. SST values greater than 28°C and anomalies less than -0.5°C are shaded. Stippled areas indicate anomaly values greater than 0.5°C. Anomalies are computed based on the COADS/ICE climatology (Reynolds, 1988, *J. Climate*, 1, 75-76).





**FIGURE 2.** Depth of the 20°C Isotherm Along the Equator in the Pacific Ocean. The contour interval is 10 m with shading for values less than 50 m and also for values greater than 150 m.

# GENERAL NOVEMBER – MARCH HEMISPHERIC ANOMALY PATTERNS



**FIGURE 3.** Temperature and precipitation anomaly patterns generally found during November – March in warm (ENSO) episodes.

# ATMOSPHERIC AND SEA SURFACE TEMPERATURE (SST) INDICES

DATE	SLP ANOMALIES		TAHITI-DARWIN SOI	PACIFIC 850 MB ZONAL WIND INDICES			PACIFIC 200 MB ZONAL WIND INDEX	OLR INDEX	PACIFIC SST					
	TAHITI	DARWIN		5N-5S 135E-180	5N-5S 175W-140W	5N-5S 135W-120W			5N-5S 165W-110W	5N-5S 160E-160W	NINO 1+2 0-10S 90W-80W		NINO 3 5N-5S 150W-90W	NINO 4 5N-5S 160E-150W
OCT 91	-1.8*	0.4*	-1.4*	-0.1	-0.8	-1.2	-0.6	-0.3	0.4	21.1	0.8	25.6	1.2	29.6
SEP 91	-1.4	1.4	-1.8	-1.1	-1.1	-1.3	-0.4	-0.6	0.3	20.9	0.6	25.4	0.8	29.1
AUG 91	0.0	1.4	-0.9	-0.3	-0.2	0.2	0.7	-1.0	0.3	21.3	0.5	25.5	0.9	29.2
JUL 91	0.3	0.6	-0.2	-0.2	-0.5	-0.6	0.1	-0.2	0.9	22.6	1.0	26.6	0.9	29.4
JUN 91	0.1	1.0	-0.5	-0.3	-0.8	-1.1	-0.6	-0.1	0.4	23.2	1.3	27.6	0.8	29.3
MAY 91	-0.6	1.7	-1.5	-0.5	-0.7	-0.9	-1.2	-0.2	0.5	24.6	1.0	27.8	0.9	29.4
APR 91	-1.1	0.5	-1.0	-0.2	0.3	0.2	-0.6	-0.2	-0.3	25.2	0.4	27.6	0.8	29.1
MAR 91	-0.1	2.1	-1.4	-0.9	0.1	-0.1	0.2	-0.2	0.5	26.7	0.3	27.2	0.5	28.6
FEB 91	0.0	0.1	-0.1	0.4	0.3	0.9	-0.1	-0.6	0.5	26.2	0.2	26.5	0.7	28.7
JAN 91	1.0	0.1	0.6	0.5	0.3	0.1	0.1	-0.3	0.0	24.3	0.4	25.8	0.8	28.9
DEC 90	-0.3	0.4	-0.5	-0.6	-0.6	-0.6	-0.8	-0.3	0.0	22.5	0.2	25.3	1.0	29.2
NOV 90	-0.7	0.4	-0.7	-1.7	-0.3	0.1	0.0	-0.1	-0.1	21.4	0.0	25.0	0.8	29.1

\* PRELIMINARY

\*\* REVISED

Atmospheric and SST Index Values for the Most Recent 12 Months. Atmospheric indices are standardized by the mean annual standard deviation except for the Tahiti and Darwin sea level pressure (SLP) anomalies which are in mb. SST indices (anomalies and means) are in degrees Celsius. Note that positive (negative) values of the 200 mb Zonal Wind Index imply westerly (easterly) anomalies; positive (negative) values of the 850 mb Zonal Wind Indices imply easterly (westerly) anomalies.

## CORRECTION

The previous issue of the Weekly Climate Bulletin (#91/44, dated November 2, 1991) contained a graph depicting cumulative total vs. normal precipitation during August 15 – November 2, 1991 at Lynchburg, VA on page 6. Shortly after that issue was published, our staff discovered that Lynchburg has been dramatically under-reporting precipitation totals for at least several months; therefore, the aforementioned graph contained invalid data. A similar precipitation graph for Roanoke, VA, which is located approximately 42 miles (68 km) west of Lynchburg, is shown below.

### ROANOKE, VIRGINIA

Cumulative Total (solid line) vs.  
Normal (dashed line) Precipitation  
August 15 – November 2, 1991

